

# Contractors and Engineers Monthly

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*Be Sure to Read*

## Airports, Civilian and Army

The start of New York City's giant post-war airport at Idlewild, L. I., which is designed to be one of the world's largest and busiest air terminals, with 4,057 acres and 9 miles of concrete runways as the first stage of its construction, is described in this issue, which also contains a description of the bituminous paving involved in the extension and strengthening of runway facilities at an Army Airfield in Arizona.

See pages 1 and 23.

## Wooden Bridges, Then and Now

The passing of the old wooden covered bridge is a matter of regret to many, but the frailty of the one at Charlemont, Mass., led the town fathers to make a poetic appeal for its replacement. This call was answered by the Department of Public Works, which now has a new concrete-and-steel span under construction. A modern timber structure on an access road to mines in Montana is also described in this issue.

See pages 2 and 61.

## Access Roads Aid War Effort

The construction of access roads has been one of the road-building industry's great contributions to the war effort. In this issue are articles on the use of a traveling-plant mix on an access road to a war plant in New Mexico, and on the construction of roads to mica mines and vital timber areas in New Hampshire.

See pages 2 and 11.

## Preparation for Winter

The annual snowfall in Michigan is something for highway maintenance men to reckon with. The story of the preparation for winter maintenance, to keep Michigan highways open and safe for winter travel, is told in this issue, and contains helpful hints for other highway engineers in the snow belt.

See page 7.

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## Post-War Airport Started New York City Begins Construction Of Its 4,057-Acre Airport at Idlewild

† TO furnish unparalleled commercial airport service at the close of the war, New York City has assumed the responsibility for expanding an earlier air-base project on the northeastern shore of Jamaica Bay, Borough of Queens. LaGuardia Field, the city's present municipal airport, has an area of 550 acres and is the world's busiest commercial air terminal. The new airport at Idlewild, a contract for the partial paving of which was awarded late in September, will have an eventual field area of 4,057 acres and 9 miles of concrete runways at the conclusion of its first stage of development. Its location 13 miles over the road from the Airlines Terminal at 42nd Street and Park Avenue, across the street from Grand Central Terminal, in New York City is advantageous.

### Inception of the Project

The Engineer Corps, U. S. Army, awarded a contract on February 1, 1942, for pumping in 3,000,000 cubic yards of sand fill on a part of the site of this airport to provide a base for runways for an Interceptor Command. Under ar-

### Contracts Are Awarded for The First Phase of Huge Project; Hydraulic Fill Is Almost Completed

By THEODORE REED KENDALL,  
Editor

rangements with the city, this was abandoned when the civilian project was started.

The project was initiated as a city undertaking by Mayor F. H. LaGuardia in 1942. While the eventual cost is expected to be in the neighborhood of \$100,000,000, most of that amount will be spent after the war. The \$9,250,000 received by the city from the sale of Floyd Bennett Field was earmarked to pay a part of the future costs of the development of the new airport, including the runways and taxiways, hangars, and the administration building.

The first stage of construction at Idlewild, without hangars, involves the following expenditures:

Land acquisition	\$ 5,000,000
Fill and bulkheading	8,800,000
Drainage, field	5,200,000
Sewers, storm and sanitary	

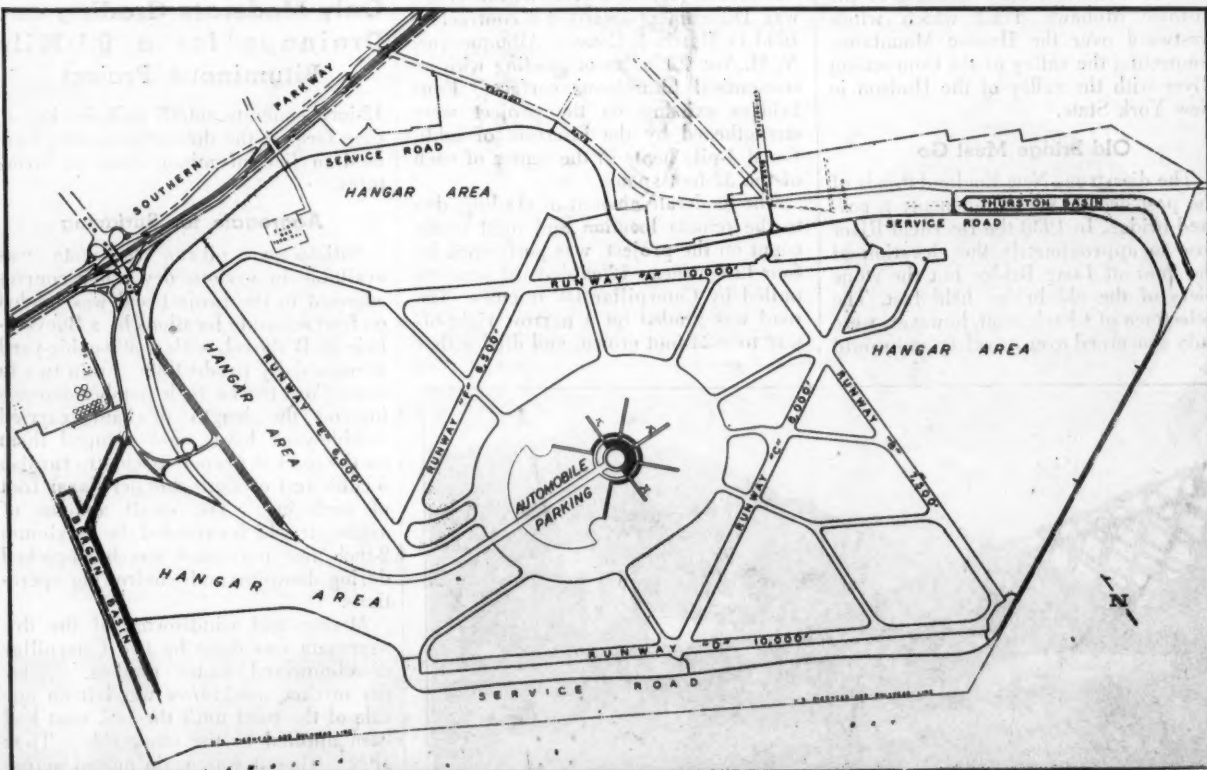
Paving, 6 runways	10,000,000
Field lighting and radio aids	1,100,000
Utilities	2,300,000
Access roads	2,800,000
Administration building	7,500,000
CAA building	500,000
Utility building	500,000
<b>Total</b>	<b>\$45,700,000</b>

### Design and Layout

Originally only 500 acres, the airport site has been successively increased to 1,200, 2,576, and at present to 4,057 acres or  $7\frac{1}{2}$  times the size of LaGuardia Field. The present plans are for stage development of the airport with six of its twelve runways to be built in 1945 and 1946. These six runways will be developed later into a parallel or tangential pattern. The total dredged fill to convert the area into a satisfactory self-draining field amounts to 41,000,000 cubic yards, of which 32,500,000 cubic yards have been pumped to date (See C. & E. M. October, 1943, page 9). A contract for 8,500,000 cubic yards of additional hydraulic fill now in progress will complete the dredging.

The first six runways will be 9 miles in length, requiring 5.6 miles of taxi-

(Continued on page 16)



Layout of the first six runways and administration building to be constructed at the New York City municipal airport at Idlewild, Borough of Queens, Long Island, N. Y.



# New Span Replaces Old Covered Bridge At Charlemont, Mass.

**One of Oldest Structures  
In New England, Built in  
1833, Torn Down as Steel  
And Concrete Span Rises**

By WILLIAM H. QUIRK,  
Eastern Field Editor.

THE picturesque covered bridge at Charlemont, in Franklin County, Mass., has finally succumbed to the ravages of time and the onward march of technological progress and is being replaced by a modern structure of steel and concrete. Long Bridge, as it was known, was one of the oldest and longest of New England's covered bridges, only a few of which still remain to give evidence to the engineering and construction ability of early New Englanders, to say nothing of the stoutness of the building materials employed. Built over the Deerfield River in 1833, Long Bridge was of wood lattice-truss construction for two spans and a wood arch on the third span, covered with a wooden roof and the sides boarded to protect the trusses from the elements. These covered wooden bridges were found to be much more permanent than open structures. Three spans of 99, 112 and 132 feet combined to give a total length of 343 feet, with a width of 16 feet from truss to truss. The builders considered their bridge capable of carrying a 6-ton load but early residents of Charlemont saw over eight times that weight cross safely. Iron ore was once mined at Rowe, Mass., a few miles north of the bridge, and carried in 4-horse wagons to ore sheds on the south side of the river where the Boston & Maine Railroad has a freight and passenger depot. These ore wagons and their contents weighed over 10 tons apiece, and it was not uncommon to have four or five of these lumbering juggernauts crossing the bridge at one time.

The bridge was built on the site of an old ford, and a rock in midstream served as a depth gage. The river was safe for crossing as long as the rock was not fully submerged, for the water then would not rise above the hubs of the wagon wheels. This ford marked the beginning of the historic Mohawk Trail which winds westward over the Hoosac Mountains, connecting the valley of the Connecticut River with the valley of the Hudson in New York State.

## Old Bridge Must Go

The disastrous New England floods of the past decade wiped out many a covered bridge. In 1938 the Deerfield River rose to approximately the elevation of the floor of Long Bridge but the stone piers of the old bridge held fast. The Selectmen of Charlemont, however, were duly concerned over its safety and would

permit only passenger cars and unloaded 1½-ton trucks to cross the bridge. Furthermore, each person using the bridge was requested to sign a waiver relieving the Town of Charlemont of any responsibility in case of failure of the structure. Last year the aging bridge was closed to all but pedestrian traffic. In the meantime the Town Board petitioned the Commonwealth of Massachusetts for a new bridge. Selectman Healey, now somewhere with the U. S. Navy, viewing with alarm the condition of the century-old bridge, felt constrained, like Paul Revere, to warn the Commissioner of Public Works of what might happen. With due apologies to Henry Wadsworth Longfellow, the following poetic appeal was dispatched to the Commissioner in Boston:

### APPLICATION FOR OLD-BRIDGE ASSISTANCE

Listen, Commissioner, and you shall hear  
From a Board of Selectmen, crazed by fear,  
That in the dead of night, with a mighty roar  
The old Long Bridge will be no more.



Typical of the horse and buggy era, the old covered bridge is fast disappearing from the scene. One of the most recent to go is the 343-foot Long Bridge which has provided a crossing of the Deerfield River at Charlemont, Mass., since 1833.

For 100 years this bridge has stood  
(But for the past 15 has been no good)  
And loving hands have patched its pants  
Till naught remains but food for ants.

By the grace of God it stands today,  
Exactly why, no man can say.  
But in the breeze its sways and jerks  
Should give the chills to Public Works.

On all the Board the hair is raised,  
And daily we avert our gaze;  
At night to sleep we daren't start  
For fear the bridge will fall apart.

So weak and feeble is one spanny  
That birds no longer park their fanny  
For fear this structure old and hoary  
Will any minute go to glory.

And so, Commish, with pen in hand  
We let you know how matters stand;  
How every time the planking flops  
Beneath, the river licks its chops.

The old Long Bridge is falling down  
Right in the middle of our Town.  
Please view this matter with alarm  
And do not let us come to harm.

The Massachusetts Public Works Department, duly impressed yet quite unphased by the metrical appeal, had a ready response drafted by the Department muse:

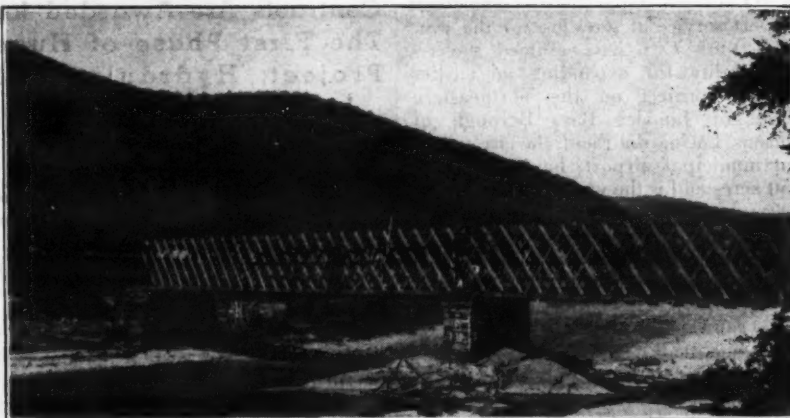
Of you, Selectmen, crazed with fear  
Is my turn to ask your ear.

Your long lament fills me with fright  
Lest old Long Bridge should prove a blight.  
Yet if it for a century stood  
For one more round it should be good.

If helpful hands of the "Public Works"  
Can end its dangerous sways and jerks,  
So rest assured you're safe from harm  
Since "Public Works" hears the alarm.

And having heard has started out  
In cooperation—have no doubt.  
And when we know how matters stand  
Again my pen I'll take in hand.

Listen then, and you shall hear  
How well we plan to still your fear—  
The "Public Works" is on its toes  
And fearlessly you may repose.



The covered bridge at Charlemont, Mass., in the process of dismantling. This stage of removal shows the wood-pin-connected lattice truss of the old bridge.

## Traveling Plant Used On N. M. Access Road

TO provide access to an important war facility, the New Mexico State Highway Department awarded a contract in 1944 to Martin & Cowart, Albuquerque, N. M., for 9.1 miles of grading with an economical bituminous surface. Four bridges existing on the project were strengthened by the insertion of additional 4-pile bents in the center of each of the 32-foot spans.

The moderate amount of grading, due to the remote location and light traffic count on the project, was performed by four LeTourneau 12-cubic-yard scrapers pulled by Caterpillar D8 tractors. The road was graded on a narrow right-of-way to a 24-foot crown, and dips with a

## Isolated Location Requires Only Moderate Grading and Drainage for a 9.1-Mile Bituminous Project

12-inch concrete cut-off wall, having an ogee face on the downstream side, were used in lieu of minor drainage structures.

### Aggregate for Surfacing

Satisfactory pit-run aggregate was available in various dry water courses adjacent to the project and was loaded on four separate locations by a Bucyrus-Erie 20-B shovel, with a 500-cubic-yard average daily production. From two to seven Ford trucks, their number depending on the length of haul, carried 3-cubic-yard loads, and dumped them on the road at proper spacing to furnish 5 cubic feet of aggregate per linear foot of surfacing. The small amount of aggregate which exceeded the maximum 2-inch size permitted was hand-picked during dumping and windrowing operations.

Mixing and windrowing of the dry aggregate was done by two Caterpillar diesel-powered motor graders. After dry mixing, a windrow was left on one side of the road until the tack coat had been applied to the other side. Then after curing it was again moved across the road, and after application and curing of the remainder of the tack coat,

(Concluded on page 13)

For sentimental reasons it was originally planned to restore the old bridge as a historical monument, using wood construction. However, to get the maximum strength required for modern bridge loadings, timber costs would run to \$100,000, while a modern bridge of steel and concrete could be built for less than \$60,000. Furthermore no wood is available because of serious shortages in the nation's lumber supply. Maintenance costs would also be greatly higher for such a wooden bridge than for one of steel and concrete.

Therefore, the new Depot Street Bridge connecting the Town of Charlemont on the north bank of the Deerfield with the railroad on the south side is being constructed of steel stringers with a concrete deck supported by concrete abutments and three concrete piers. It has four 75-foot spans center to center of bearings, or a total length of 308 feet out to out of posts. The bridge is 27 feet 6 inches wide, having a 24-foot roadway which will be 21 feet above the average water elevation. Design is for H-15 loading.

### Removing Old Bridge

The new bridge occupies the location of the old so the initial step in construction was to tear down the old covered bridge. First, the roof and sides were carefully removed. According to a regulation of the War Production Board, only used lumber could be employed in form work on the new bridge so old Long Bridge was still useful even after being razed. Next the truss was jacked up from the top of the pier and placed on rollers. Cables were attached to the bottom chord and hooked up with the town tractor and bulldozer, a 4-ton Mack truck crane with winch attachment, and to the boom of a Byers ¾-yard gas shovel. Even with this combined pulling power the truss left the pier slowly and reluctantly, crashing to the ledge below. More lines were attached to the broken

(Continued on page 32)



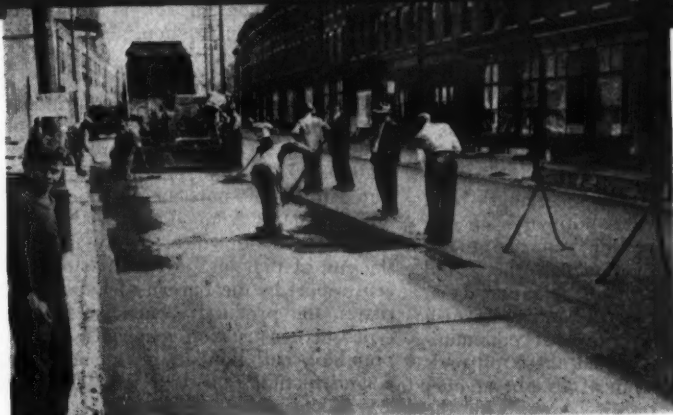
The truss of Charlemont's old covered bridge left its piers reluctantly but finally became resigned to its fate and succumbed to the combined pulling power of the town tractor, a 4-ton truck, and a power shovel.



# Smoothing the way for post-war traffic



Section of the worn granite block pavement on Ridge Avenue, Philadelphia, which is partly covered by a Texaco Asphalt binder course.



Traffic uses completed half of Texaco Asphalt pavement, while the other half is under construction.

Texaco Sheet Asphalt wearing surface being laid on half the thoroughfare at a time by the Union Paving Company.



Ridge Avenue, one of Philadelphia's busiest thoroughfares, serves the heavy traffic flowing into this city from the northwest. Because of the worn, rough condition of the old granite block pavement on Ridge Avenue, its improvement had become one of the city's most pressing paving problems.

Philadelphia solved this problem by using the well-consolidated granite block street as base for a resilient, heavy-duty Texaco Sheet Asphalt pavement. An asphalt binder course was laid over the old, uneven blocks to provide a level surface on which to construct a dense, durable Sheet Asphalt wearing course.

Traffic continued to use Ridge Avenue while half the new Texaco Asphalt pavement was being laid at a time.

Philadelphia is well acquainted with the rugged durability and low upkeep cost of Texaco Asphalt paving. More than 1,000,000 square yards of its streets have been Texaco-paved.



The new, heavy-duty Texaco Sheet Asphalt pavement which now serves Ridge Avenue traffic.

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# TEXACO ASPHALT



# Contractors and Engineers Monthly

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## Contractors Expect Busy Post-War Period

General contractors are prepared to start civilian construction programs as soon as the war with Germany is over, which will provide jobs directly and indirectly for several million men and women, William Muirhead, President of the Associated General Contractors of America, stated recently. Returning from a 30-day trip to the west, southwest and south, Mr. Muirhead reported that he found a general optimism among construction men concerning what large-scale construction programs could do towards providing needed employment in the transition from war to peacetime pursuits.

However, business and industry are urged by Mr. Muirhead to develop their construction programs now, so as to be ready to start work just as soon as the materials and labor become available. He pointed out that in an active economy private construction is two-thirds of the total construction, and private initiative should furnish the largest part of employment.

The AGC reports that contractors have on hand construction equipment and machinery valued at approximately \$2,000,000,000, and that they are prepared to handle new construction at an annual rate of from \$11,000,000,000 to \$12,000,000,000 within one year after the end of the war. According to a recent report by the Bureau of Labor Statistics, the productive capacity for all types of construction materials, except plumbing and lumber, is sufficient for a construction rate of \$15,000,000,000 a year.

The construction industry is the second largest industry in America and is the largest employer of labor, the AGC declared. It can put from 7,000,000 to 10,000,000 people to work on construction projects, on and off the site, without the necessity for any time-consuming retooling and reconversion of plants and equipment.

## A Report on Proposed Post-War Public Works

The report of the survey of post-war public works contemplated by state and local governments, made by the Federal Works Agency in collaboration with the Bureau of the Census at the request of the Special House Committee on Post-War Economic Policy and Planning, has



"It's our newest contribution to the war effort; it builds its own runways."

been completed and turned over to the Chairman of the Committee, to be analyzed and studied in connection with other material the subcommittee has assembled.

The report shows that the Public Roads Administration and the state highway departments have \$219,151,000 of Federal-Aid and state highway projects completely planned and ready for construction; \$957,242,000 in the design stage; and \$1,018,111,000 in the preliminary stage. The survey revealed that the great bulk of contemplated state and local post-war public works, exclusive of Federal-Aid and state highway projects, is in the "preliminary" and "idea" stages of plan preparation. Plans in the completed stage represent a total estimated cost, including land purchase, of \$969,858,000; plans in the "preliminary" stage, \$3,701,884,000; and plans in the "idea" stage, \$6,297,387,000. Projects in the "idea" stage are those contemplated for construction within the next six years.

The report states: "Significant is the fact that about two-thirds of the plan preparation (for state and local post-war public works other than Federal-Aid and state highway projects) which has been brought to the completed stage is reported by the state and local governments of only five states, New York, California, Illinois, Michigan, and Ohio. About two-fifths of all work in the completed stage of plan preparation is concentrated in five cities, New York, Chicago, Philadelphia, Detroit, and Los Angeles."

The report also reveals that in only four states, New York, California, Michigan, and New Jersey, has legislation been enacted authorizing the provision of state funds to aid city, town, village, and county governments in financing the preparation of plans for their proposed post-war public works.

## Material for Postponed Meeting to Be Published

Although the Twenty-Fourth Annual Meeting of the Highway Research Board, originally scheduled to be held in Cincinnati, Ohio, on November 22 to 25, has been postponed because of transportation difficulties due to the war, it is planned to publish the customary annual volume of *Proceedings* which will contain the papers and reports intended for presentation at the meeting.

In making this announcement, Roy W. Crum, Director of the Board, expressed the hope that improved conditions will make it possible to hold the meeting early in 1945.

"Obviously one of the fundamental approaches to the problem of surplus construction equipment when the war ends is that of placing construction equipment at work on urgently needed projects of all kinds. Authoritative studies of post-war employment conditions place the surplus of labor over jobs at upwards of 9,000,000. With equipment at hand and workers available, both private and public construction should be given every encouragement."

—E. R. Galvin, President, Manufacturers Division

## Transportation Monopoly Threatened; Competition Is Still the American Way

The strength and might of America have been built on individual enterprise, on competition and the resultant inventions and savings. Although the necessities of war have thrown greater industrial power into the hands of a few, we must not permit any group, automotive, railroad or labor, to lay a stranglehold on the economic life of this country through monopoly.

With the opportunity before us for a growth in transportation never before known, even in the days of the first transcontinental railroad, there must be no strangling of free enterprise in the economic distribution of our raw materials, food stuffs, and manufactured goods. Water carriage of ore, fuel and the like, coastwise, over the Great Lakes, and on our river and canal systems is slower than by other means but has its economies for certain types of goods and must not be inhibited.

Next come the long-distance and intermediate-distance freight hauling by our railroads, fast and sure. The highway with motor-freight haulage is the third link, faster on short and some intermediate hauls and, where no dictatorial and unwarranted high rail rates exist, gives way to the railroad on the long hauls. Last comes our newest mode of transport, through the air. It has its type and character of goods best served by air freight and air express, usually on the very long transcontinental hauls.

Into this balanced machinery of freight handling a monkey wrench has been thrown by certain railroad groups. They would set aside the Sherman Anti-trust Act as it applies to transportation. According to Wendell Berge, Assistant Attorney General of the United States, "This plan which is advanced in the name 'free enterprise', contemplates the development of regional integrated transportation systems, which would control and operate rail, motor, water, and air transport facilities throughout large geographic areas. . . . It requires no extended analysis to understand the economic power of such 'integrated transportation systems'. Such regional monopolies of all forms of transportation would possess the power of life and death over every community and every industry. Their rate policies would determine the location of industry, the sources from which raw materials would be drawn, the markets to which finished products would move, the possibilities of geographical shifts of population and industry, and the employment opportunities for a large proportion of the workers in industry, trade, agriculture and mining."

This statement has been characterized by C. E. Johnston, Chairman of the Western Association of Railroad Executives, as "a new phase of the same old

paign of the antitrust prosecutors". True it is that peculiar prosecutions have been threatened in the name of antitrust laws, but this disparaging remark by a railroad executive is untimely, since it comes from a section reported to be sponsoring abrogation of the Land Grant Act which gave the railroads in the west vast grants of land to furnish rights-of-way and sites for communities, with the proviso that these railroads carry U. S. government freight at one-half the tariff rate. Today, with the railroads in better financial condition than for decades and carrying a tremendous volume of the half-rate freight, to aid in winning the war, they ask full rate for Federal freight, and also seek monopolistic control of all means of transportation.

Our highways are built and maintained with the money accrued through a virtual mileage tax on all traffic over them, with certain other taxes assessed on commercial vehicles because of their character. The use of these highways, as well as our waterways, must be open to free competitive enterprise, the small as well as the large, totally devoid of monopoly by railroads, the Federal government, or any other group which would endeavor to gather it under one ownership or control.

LEND OVER HERE TILL IT'S OVER OVER THERE





# WINTER

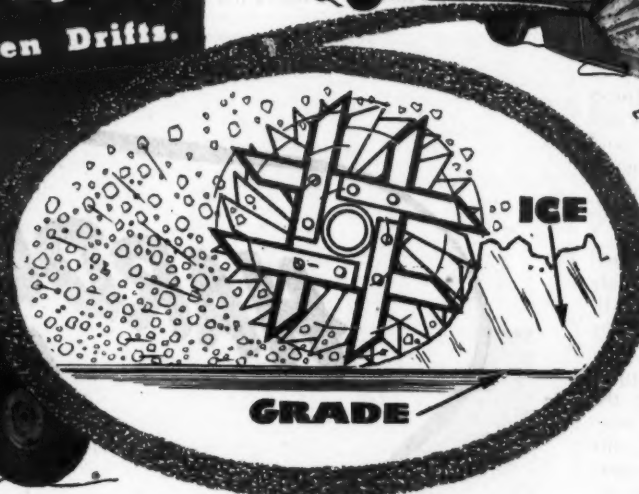
## AND THE SEAMAN PULVI MIXER

Like Giant Icepicks,—The New Seaman "Shock-Cushioned" Tines Chop, Pulverize and Clear Ice on Runways and Highways and Level Hardpacked, Frozen Drifts.



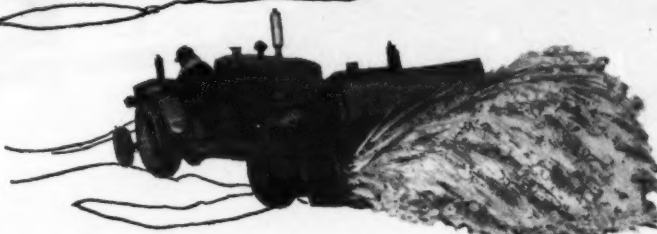
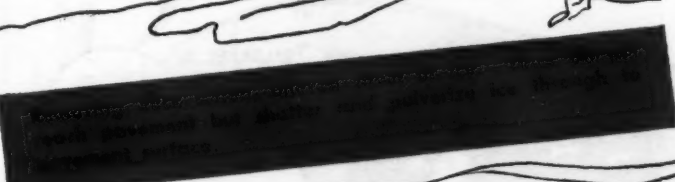
### The SEAMAN "Shock-Cushioned" Tine

Impact with ice is "cushioned" by a compensating device which holds each tine group rigid with the rotor until contact-shock reaches engineered limit. This limit however is beyond shattering point of ice. Tine groups then stop individually until obstacle is cleared and before time breakage can occur.



STAND CLEAR when the SEAMAN MIXER — equipped with the new "shock-cushioned" tines — roars down a rutted, ice-covered runway or road, — for an avalanche of chopped, pulverized ice erupts from the open hood — and leaves a leveled path behind . . . Frozen, hard-packed drifts are cleared in a minimum of time when the Seaman "gets its teeth in 'em" . . . There's no damage to the pavement for the spinning rotor can be so set that the tine periphery does not contact the paved surface . . . And since each individual group of tines is governed by a compensating device which stops any group momentarily when excessive shock is encountered, — time damage is negligible.

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U. S. Army News Photo

A D-8 Tractor Dozer with armored cab works on a road crater.

## Tractors Equipped With Armored Cabs

The new armored-cab tractors used by the Army Engineers look as though they were operated by automatons. These armored cabs were developed by the Engineer Board, with the Chief of Ordnance acting as consultant on the use of armor plate, and are designed to protect tractor operators from small arms and machine-gun fire, land mines, hand grenades, and bombshell fragments. They have been in particular demand by Aviation Engineers operating in advance areas.

All sizes of cabs are of the same general design, having 1/2-inch armor plate on all sides and on the roof for all-round protection. Bolt holes, with nuts welded on the inside, have been provided so that the cab can be shipped "knocked-down" and assembled in the field. The earlier models of cabs were provided with vision ports and slits which permitted 20 to 50 per cent operating efficiency when working under fire, and up to 100 per cent efficiency at other times. The present design of cab provides for periscopes that do not hamper the vision of the operator when the cab is "buttoned up".

The need for armored cabs to protect tractor operators was first demonstrated in dense jungles where Engineers had to clear trails for infantry troops. In several cases, the enemy made a practice of bombing a runway and then, when the tractor operators were busy filling the craters by means of their bulldozers, of sending in low-flying planes over the field to strafe them. The armored cabs offer protection against small-arms fire.

On Guadalcanal the Engineers carried loads to within 100 yards of the front lines. At least one observer stated that he had seen an Engineer on a bulldozer stop, reach behind him for his gun, shoot a Jap sniper out of a tree, and continue his work. An Intelligence Report from the African Theatre stated that there was a need for armoring tractors to protect operators filling shell holes in fields mined by the Germans.

Actual designs of these cabs were begun in September, 1943, and by the end of the following month plans and speci-

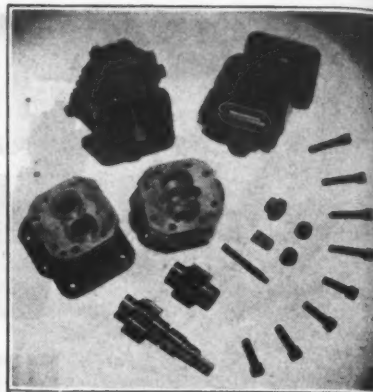
fications were completed and procurement initiated. The first shipment of armored cabs was made in November, 1943, and continued at the delivery rate of 200 per week. They are now available in every theatre of operation and

have proved exceedingly popular. Although the cabs do not make tanks out of the tractors, and cannot give the operator complete protection, they greatly increase his morale and his chance of surviving enemy action.

## A New Rotary Pump For Low Pressures

A new low-pressure rotary pump, designed particularly for use as a lubricating booster pump for oil lines, as a gasoline dispensing pump, or for oil pressure systems on automotive, truck or tractor equipment, has been announced by John S. Barnes Corp., Rockford, Ill. The capacity of this pump ranges proportionately from one gallon per minute at 600 rpm to four gallons per minute at 2,400 rpm.

The patented spur gear tooth form of the new pump is one of its features. This special tooth construction eliminates excessive sliding and reduces slippage of the fluid when pumping. Each tooth



A disassembled Barnes rotary pump.

completely fills the mating space as the gears mesh, effecting complete sealing. Thus positive displacement of the fluid is assured, despite a variation in viscosity or other factors.

Complete information regarding this new pump and its many applications may be secured direct from the manufacturer.

# HARDLY NOTICED

... but not insulted!

● It's no insult to a Pierce Flyball Governor when it is hardly noticed in its regulation and protection of a Diesel engine that powers equipment used in pipeline pumping, or any one of hundreds of industrial applications in which good governing is required—or desirable.

With only regular lubrication and cleaning, Pierce Governors give dependable engine regulation and maximum protection—without calling attention to themselves for ragged performance, frequent adjustment or need of some "tinkering."

The famous flyball principle means positive compensation for change in load on jobs where constant speed is required. It means *mechanical* dependability for unfailing protection against destructive overspeed and abuse. And rugged design plus durable construction makes Pierce Governors give satisfactory performance often beyond the service life of the engine itself.

Pierce Governors for Diesel engines are available in two types—either driving independently of the fuel pump, or directly from the fuel pump shaft. If your present Diesel engines are not Pierce-equipped, write for full information.

THE PIERCE GOVERNOR COMPANY, INC., 1615 OHIO AVENUE, ANDERSON, INDIANA  
Manufacturers of Pierce Precision Governors and Sisson Automatic Chokes  
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VALUABLE IN PEACETIME A NECESSITY NOW

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# Michigan Prepares For Winter's Snow

**"Speed Plowing" Technique  
Is Used by Highway Dept.  
To Clear Snow From Roads  
Almost as It Falls**

(Photo on page 88)

IN a state that has areas where an annual snowfall of 20 feet was recorded only two years ago, the highway department must give serious thought to and make proper preparation for keeping its roads open to traffic under such hazards of nature. Because of its unique geographical location in being practically surrounded by the Great Lakes, Michigan has three climatic belts where snow and ice conditions vary greatly. Maintenance engineers of the Michigan State Highway Department vary their methods of snow control to suit these different localities.

In the lower climatic belt which extends northward from the boundaries of Indiana and Ohio to a line roughly between Muskegon on Lake Michigan to Saginaw Bay on Lake Huron, about 30 per cent of the time and money for winter maintenance goes for snow removal, while the remaining 70 per cent is used in ice control. The remaining upper half of the Lower Peninsula, in the middle belt, has about an equal division between snow removal and ice control. The Upper Peninsula, or top climatic belt, where the wintry influence of Lake Superior is very much in evidence, requires 30 per cent attention for ice control, 10 per cent for snow fencing, and the remaining 60 per cent for snow removal. In parts of this region a total snowfall of 20 feet was recorded in the winter of 1942-43. Snow comes early on the Upper Peninsula, and these roads require more heavy equipment than do those in the other parts of the state.

The best method of defense against the paralyzing effects of a road-blocking snowfall is preparedness and attack, according to Charles M. Ziegler, Commissioner of the Michigan State Highway Department. Preparedness consists of having equipment and personnel ready to go into action the moment the need arises, and attack embraces the "speed plowing" technique used by the Department. This method is not the showy, spectacular throwing of huge piles of snow from the highway with heavy equipment, but the use of lighter 1½-ton trucks equipped with blade plows which take to the road as soon as the snow starts falling. These trucks travel along briskly at a 15 to 20-mile-an-hour clip with the purpose of keeping the snow moving off the road, never giving it a chance to settle and pile up. In most cases this method is successful, but when the rate of fall is rapid and prolonged, heavy equipment is moved in to augment the light fast-moving truck plows.

Of the eighty-three counties in Michigan, fifty-six have contracts with the Michigan State Highway Department for snow removal and ice control. Under these contracts, the county furnishes its own equipment, performs the work, and is reimbursed by the State for all expenditures for labor and material, and is paid rental for the use of equipment. The overhead expense involved is also paid by the State. Each county must satisfy the State Highway Department as to the kind and amount of equipment available and to its being in perfect condition. In the remaining twenty-seven counties, the State Highway Department performs the work on snow and ice, using its own forces.

## Snow Fences

Snow fences are generally put up

around November before the ground freezes, and are used only where drifts constantly form. Fences are erected parallel to the road between 75 and 125 feet from the center of the roadway. Posts are driven about 12 feet apart to a depth sufficient to keep the post erect. The fence is fastened to the posts with wire ties, guyed at each end, and side-guyed against prevailing winds. In northern districts the fence is mounted from 12 to 18 inches above the ground, and in the southern districts 6 inches above the ground when first erected. As the snow accumulates, the fence is raised in order to gather snow effectively. Extension posts are used if necessary.

## Organization

In the snow-removal program, trunk



Pulling in snow from a high bank along a Michigan highway with a wing plow on a motor grader, preparatory to throwing the snow off the right-of-way by means of a rotary plow. This is the first step in widening the travel way in an area where the snowfall is heavy.

lines are cleared first, and during the snow season maintenance employees are on 24-hour call. In cities and villages of under 20,000 population not having a contract for snow removal, the State Highway Department plows the snow

from the state trunk lines the entire width of the street. The Department cooperates with the local village or city authorities to share in the snow-removal operations. Usually, State trucks and

(Continued on page 20)



## O-P-E-N C-E-N-T-E-R

**L**ONG the first choice of contractors for off-the-road operations, these tough Sure-Grips have even greater job stamina today because they're now armor-built with Rayotwist cord—Goodyear's patented rayon cord — making the strongest body ever used in a work tire!

With Rayotwist-armed carcass, these Goodyears are

by far the finest work tires that can be built from today's available materials — including the mandatory amount of synthetic rubber. They deliver more ton-miles of heavy-duty service.

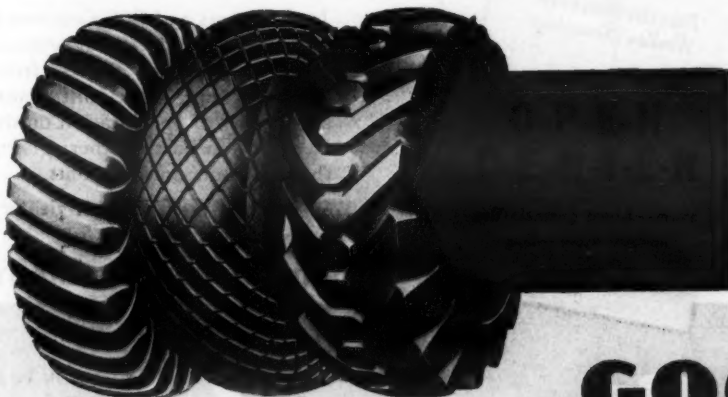
And thanks to its O-P-E-N C-E-N-T-E-R self-cleaning tread, this tougher-than-ever tire has no dead-end pockets to trap mud and cause slippage. Its wide, unblocked channels sluice out dirt and stones, leaving those massive lugs free to bite deep and pull in any going.

This adds up to the longest-lasting, hardest-working tire available — a tire that delivers more work at less cost!

For proof of that, ask the men who are using Goodyears. When you do, chances are you'll soon be using them too.

Rayotwist, Sure-Grip, All-Weather—T.M.'s  
The Goodyear Tire & Rubber Company

**BUY WAR BONDS—BUY FOR KEEPS**



**HARD ROCK  
LUG**  
for all rock work

**ALL-WEATHER  
EARTH-MOVER**  
for drawn dirt-movers

**SURE-GRIP**  
for traction in soft going

# GOODYEAR

THE GREATEST NAME IN RUBBER

**MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND**



# How to Get Results In Compacting Soils

## Effect of Soil Character, Moisture Content, Roller Type, Weight and Speed and Layer Thickness Reported

♦ A SERIES of cooperative studies of soil compaction under varying conditions in Indiana and Ohio was recently completed and reported by engineers of the Public Roads Administration, the State Highway Commission of Indiana, and the Ohio Department of Highways. The major problems considered were the control of field operations by laboratory tests and the efficiency of different types of rollers. This abstract of the full report in Vol. 24, No. 1, of *Public Roads* gives the essential data and conclusions, but soils engineers and others interested in the minute details are referred to the 26-page original report.

### Projects Described

The Indiana project was a relocated section of State Route 57 southwest of Bucksburg in Gibson County, and extended for a distance of approximately 0.8 mile. The area is flat, poorly drained, and subject to inundation.

The Ohio project was located on U. S. Route 24 in Delaware County and was approximately 1.5 miles long, following the location of an old brick road. Changes in grades and widening of the roadway, however, required the placing of considerable fill material over the old road. The topography is rolling and surface drainage is good.

In all, seventeen sections were constructed: eight in Indiana, varying in length from 400 to 500 feet; and nine in Ohio, varying in length from 450 to 750 feet. The test sections have a top width of 42 feet and side slopes of 2 to 1 on the Indiana project and 1½ to 1 on the Ohio project.

Three different types of rollers were used in each state. The Indiana fill was

constructed in layers ranging from 6 to 12 inches, and the Ohio fill in layers ranging from 6 to 9 inches in thickness. On all sections of the Indiana project and sections 8 and 9 of the Ohio project, it was required that rollers compact each layer to a density equal to 95 per cent of the maximum density of the soil as determined by the standard compaction test. In Indiana the basis was the maximum wet weight per cubic foot while in Ohio the basis was the maximum dry weight per cubic foot resulting from the compaction test. On sections 1 to 7 of the Ohio project, it was required that each layer of soil be compacted to maximum density. On section 1 of the Indiana project and all sections of the Ohio project, it was required that the moisture content of the layer at the



The pressure sprinkler applying water to dry sections of the test soil-compaction project in Delaware County, Ohio.

time of compaction should be within 1 of the optimum moisture content of the soil used in the layer.

### Types of Rollers Used

The compacting equipment included sheepfoot, three-wheel, and pneumatic-

tire rollers. The sheepfoot rollers were of two general types, A and B, with the dimensions, weights, and working pressures as given in the table on page 26. Common to both types were two drums, which rotated independently of

(Continued on page 26)



## "CLEVELANDS"

Taking the Tough Jobs In Stride Is A Proved CLEVELAND Characteristic

For more than twenty years "CLEVELANDS" have been put to the toughest tests on hundreds of ditching jobs in all sorts of soils and over the roughest terrain, and have continuously, according to record, delivered maximum performance. Today, and since the war started, "CLEVELANDS" have been in service on a multitude of government projects at home and overseas.

Contributing to "CLEVELANDS" ability to deliver top performance under normal or emergency conditions are these features: Multi-speed Transmission—Abundant Power—Operating Ease—Maximum Maneuverability—High Capacity Digging Wheel—Correct Design—Unit Type Construction—Top Quality Material.

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• The Post-War demand for crushed aggregate for highway and all other forms of construction will be tremendous. Austin-Western is ready for present and Post-War demands with job-tested equipment, including:

Jaw Crushers and Roll Crushers in a wide range of sizes; plus matching screens, elevators, conveyors and bins.

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Your nearby Austin-Western dealer will be glad to recommend the plant best suited to your needs.

AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U.S.A.



BUY MORE  
WAR BONDS



### January AED Meeting

The Twenty-Sixth Annual Meeting of the Associated Equipment Distributors, to be held at the Edgewater Beach Hotel, Chicago, Ill., January 21-26, 1945, will have such a large attendance that a Committee on Hotel Reservations has been created to assure fairness in apportioning accommodations to member firms. All AED members are being asked to address their reservations to AED Hotel Reservation Committee, Edgewater Beach Hotel, Chicago 40, Ill.

The Executive Committee of the AED met at the Hotel Coronado, St. Louis,

October 13-14, to formulate the plans and program for the annual meeting.

### Laminated Structural Wood

At the end of the war, when many of the structural materials will again be released for construction, many state and county highway departments will be building new central and district garages, shops, and buildings for storage of equipment. The success of glued laminated-wood structural members in wartime construction has proved their economy and service, and it is anticipated that they will be used in many peacetime

structures.

Rilco Laminated Products, Inc., First National Bank Bldg., St. Paul, Minn., has issued two pamphlets devoted to Rilco beam arches and beams, Rilco standard timber trusses and boomerang arches, as well as utility arches. These red-and-blue-covered 8-page bulletins are filled with data of value to designers as well as to contractors who will be called upon to erect many structures of this type for the purposes mentioned above, as well as for other public buildings and for airport hangars. Copies of these bulletins will be sent promptly by Rilco to those mentioning this review.

### New Pioneer Dealers

The appointment of two new distributors has been announced by the Pioneer Engineering Works, Minneapolis, Minn. The Anderson Engineering Co. of Cambridge, Mass., will handle the line of Pioneer gravel and quarry equipment in the states of Maine, New Hampshire, Vermont, Rhode Island, and Massachusetts excepting the four western counties. The Tyler Equipment Corp., Springfield, Mass., will represent Pioneer in the state of Connecticut, with the exception of Fairfield County, and in the four western counties of Massachusetts.

## PUTTING THE PROVE IN IMPROVEMENTS



• This bucking bronco is a "Caterpillar" Diesel D2 Tractor taking one of the many "hurdles" that are designed to test its toughness on the "Caterpillar" Proving Grounds.

**I**F YOU'RE a long-standing "Caterpillar" Diesel user, you know that changes and improvements go into "Caterpillar" Diesel products the minute they're ready and right. There's no waiting for "yearly models."

Through the years, "Caterpillar" has given you such notable refinements as copper bellows seals for final drive, oil coolers, absorbent-type oil and fuel filters, finger-tip steering, "Hi-Electro" hardening for many vital parts, multi-speed transmissions and scores of others. Economy and dependability have been constantly improved. Only the basic design remains. It was *right* from the start.



• A "Caterpillar" Diesel D4 Tractor pulling a drawbar dynamometer and loading car to test the pulling power of a certain grouser design in various kinds of soil surfaces.

Every improvement that has ever gone into a "Caterpillar" Diesel product has first been subjected to the stiffest laboratory and proving-ground tests that could be devised. The net result is Product Dependability. With every manufacturing step controlled by one organization in one factory, there can be no possibility of compromise with quality.

Dependability is the outstanding characteristic of "Caterpillar" dealers,

too. Today they are in a position to give your "Caterpillar" Diesel equipment the kind of inspection, adjustment, maintenance and repair it needs to work at peak efficiency from now until Victory is won. Call on your "Caterpillar" dealer regularly.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

**DEPENDABLE is the word  
for "Caterpillar" Diesel**

# CATERPILLAR DIESEL



TO WIN THE WAR: WORK—FIGHT—BUY MORE WAR BONDS!



A recent War Department statement emphasized that trucks are as important as bombers. Here a convoy of GMC's passes through a French village to bring up supplies for another big offensive.

### Spreader Feeds Self On Ice-Control Work

A self-feeding material spreader that is attached to the back of a truck running from 12 to 20 miles an hour and is said to do a thorough job of spreading chips or cinders for ice control six times faster than most machines has been announced by The Flink Co., Streator, Ill. This Model WD-3 has the clutch and all operative controls inside the cab so that no helper is required.

The Flink self-feeding material spreader is built to fit all standard 5 to 7-foot bodies, is 28 inches high, and is attached to the truck in the same manner as the original end gate. The feed control is adjustable, giving a positive stop to regulate the exact amount of material to be spread. The fans which rotate on a horizontal shaft to give the proper spread to the material are of high-carbon steel. The bearings are hardened roller bearings sealed to prevent grit entering, and are equipped with Zerk fittings for lubrication.

Complete information regarding this spreader, which may be also used for seal coating as it spreads forward or backward, the full or half width of the road, thick or thin as desired, and handles all materials up to 1-inch, may be secured direct from the manufacturer.

### New Weekly Calendar With High Visibility

The 1945 weekly calendar of The Frederick Post Co., maker of drafting-room equipment, embodies two new features: the extra large size of the black numerals of the weekly date line, so that they can be easily read from any part of the drawing room or office; and the inclusion of the previous and following

months, as well as the current month, below the week line in only slightly smaller type. Each sheet of the 56-page

pad carries, in addition to the calendar material, a section of technical data such as charts on wire, sheet-metal gages, et cetera, of interest to engineers and draftsmen. The 1945 calendar, which is attractively printed in six colors, includes December, 1944. The overall size is 15 3/4 x 24 1/2 inches.

These calendars are available at a cost of \$1.00 each, or may be secured free with any order for Post merchandise. All requests should be addressed to The Frederick Post Co., Box 803, Chicago 90, Ill. Just mention this item.

### Oliver and Cleveland Tractor Companies Merge

The Oliver Farm Equipment Co., Chicago, Ill., and the Cleveland Tractor Co., Cleveland, Ohio, have announced a merger in which the latter becomes a part of Oliver. Oliver's name is changed to The Oliver Corp., and its main offices remain in Chicago. Oliver's normal production consists of wheel tractors, plows, cultivators, and similar

equipment, while the peacetime output of the Cleveland Tractor Co. consists of the line of Cletrac crawler tractors for highway, heavy construction, and agricultural purposes.

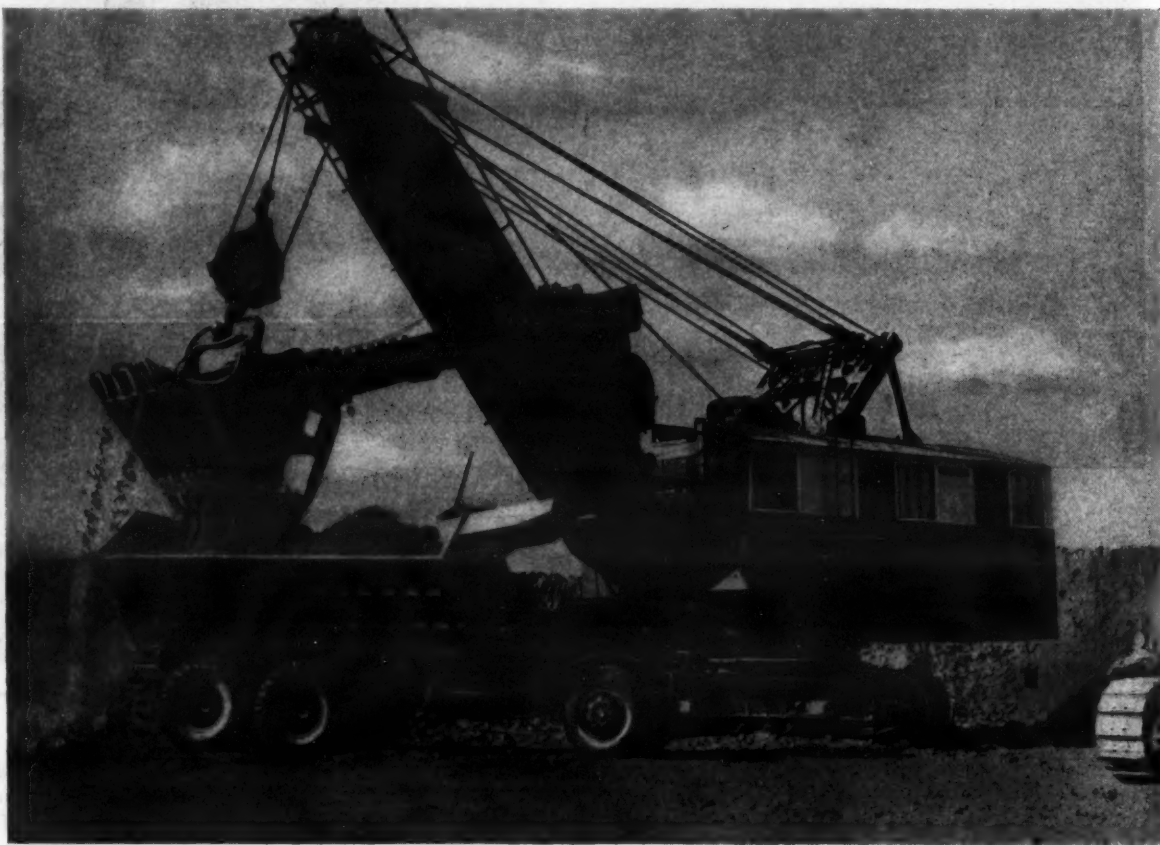
It was felt, therefore, that the products of the two companies supplement rather than duplicate each other, according to A. W. Phelps, President of Oliver, who points out that the combination will result in a better rounded and more unified distribution and management, in economies in production costs, and will offer a broader scope for post-war operation.

It is expected that W. King White, President of Cleveland Tractor Co., will be elected a Director and member of the Executive Committee of Oliver.

### Fegley Leaves Shunk

After 26 years with the Shunk Mfg. Co., of Bucyrus, Ohio, Gale H. Fegley presented his resignation as Sales Manager on September 7. Mr. Fegley has no immediate plans for the future.

## BETTER Lubrication Means Better Maintenance



Is difficult maintenance a problem? Maybe excessive wear due to inefficient lubrication is the cause. That's where Sinclair Lubricants can help.

SINCLAIR PENNSYLVANIA and OPALINE MOTOR OILS have the tough film strength that holds down engine wear, lay-offs and replacements.

Sinclair specialized gear lubricants and greases are highly efficient under all conditions. Sinclair TEN-OL 200 provides better lubrication for hard-worked Diesel-powered equipment.

(Write for "The Service Factor"—published periodically and devoted to the solution of lubricating problems.)

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FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

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YOUR  
ASPHALT  
PLANT  
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### The FLUIDOMETER

Automatic Metering System

With a Fluidometer System, a push button replaces the weighing bucket routine. When the button is pushed the Fluidometer delivers the predetermined quantity, then automatically resets for the next delivery. Or it may be operated automatically by the mixer time lock. Paving mixtures are held to precise limits of uniformity—time and operating costs saved. Adaptable to all types of plants. Write for descriptive literature.

HETHERINGTON & BERNER INC.  
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# New Hampshire Builds Needed Access Roads

## Mica Mines and Timbered Areas Made Available by Narrow, Steep Gravel Roads Usable Throughout Year

THIS country can use all the mica and all the timber it can assemble for the war effort and is overlooking no bet to expedite production of these essential materials. For this reason, the Government is financing the construction of roads to otherwise inaccessible mountain-top areas in New Hampshire where valuable deposits of mica are located, and also to the densely wooded sections in the northern reaches of the Granite State which are important timber sources. Although financed by Federal funds, the construction of these access roads is under the supervision of the New Hampshire State Highway Department, and contracts have been awarded in the usual manner to the low bidder.

A problem in the awarding of contracts was getting the contractors to the job site so they could see on what they were bidding. State engineers would drive the contractors over town roads as far as possible, continue over any old logging roads still existing, then leave the car and continue the remainder of the up-hill journey on foot. Even then it was difficult to obtain a clear picture of just where the access road was to go, because of the thick forest growth.

### Certifying the Project

Before construction can begin, the owner of a mica mine who needs an access road built to his operations applies first to the Colonial Mica Corp. in Newport, N. H., an agent for Metal Reserves Co., representing the Federal government, which controls the entire mica production in the state. The merits of the mine itself are first passed on after an inspection by the U. S. Bureau of Mines. Then the need of the road is determined by the Public Roads Administration. If these agencies agree that the mine will be productive and that an access road is necessary, final certification is given by the War Production Board. The Federal Commis-

sioner of Public Roads is then authorized to provide for the construction, improvement, and maintenance of such access roads which lead to the source of raw materials.

### Type of Road

Mica mines are usually located in thick woods at elevations from 650 to 2,000 feet, so only rough reconnaissance surveys for the roads can be made. Grades are limited to 20 per cent if the mine is not to be operated in the winter, and to 15 per cent if the access road must be plowed of snow for winter mining. No rigid requirements are established for the degree of curvature; if a loaded truck can negotiate a curve it is considered satisfactory. The roads are 10 feet wide, with turnouts of the



C. & E. M. Photo  
David Nassif Co., contractor, used a Glotrac tractor with bulldozer to clear the line of a new access road to the Carpenter mica mine near Grafton, N. H.

same width constructed within sight distance between curves. The gravel surfacing varies in thickness from 6 to 18 inches, depending on subsoil conditions. Plain-concrete 15-inch pipe in 4-foot lengths with bell-and-spigot joints

is used for culverts. When drainage demands a size greater than 15-inch pipe, it has been found more economical to build log culverts than to use larger-size pipe.

(Continued on page 52)

## This is One of 896 MOTO-CRANE JOBS

Since Moto-Crane Service, Inc., Detroit, started in 1940, they've completed 896 separate jobs covering every phase of material handling, excavating and rigging.

Some jobs lasted only a few hours, others up to 17 months; one was 240 miles from Detroit. To handle the steadily increasing demand for Moto-Crane service, this organization has built up a fleet of 6 Lorain Moto-Cranes.

Similar reports from hundreds of other Moto-Crane owners—Service Companies, Contractors, Steel Erectors, Industrials—are further proof that Moto-Crane mobility, speed-in-transit and ready convertibility to Shovel, Crane, Dragline and Clamshell provide the profitable answer to many postwar excavating and material handling problems.

### Quick Facts About the Moto-Crane

#### THE CRANE

1. Simplified Center Drive direct-to-the-point power application.
2. Balanced turntable design, to provide the greatest capacities per pound of weight.
3. Steel erector's precision boom hoist with positive power control of boom lowering.
4. 2-piece, pin-connected all-welded boom with center sections and straight or goose-neck tips.
5. Cab type tagline which functions efficiently at all boom angles and digging depths.
6. Convertible to Crane, Shovel, Dragline, and Clamshell.

Ask your Lorain distributor for the big 32-page catalog showing 78 ways to speed work—save money with a Lorain Moto-Crane.

THE THEW SHOVEL COMPANY • Lorain, Ohio

#### THE CARRIER

1. 3-axle mounting on 10 rubber tires. Both tandem rear axles drive.
2. High speed transmission range for road travel—low range for off-the-road travel.
3. Close-coupled, 175" wheel-base for better maneuvering.
4. Steering gear designed for soft ground travel.
5. Special chassis frame. No Moto-Crane frame has ever failed.
6. 10 speeds forward—and 2 reverse. Unit will climb a 30% grade.



GATKE Brake Blocks and Frictions — Molded to machined accuracy in ALL shapes and sizes —

GATKE MAKES Brake Lining Clutch Facings Frictions Non-Metallic Bearings Sheet Packing

FOR smooth, positive, non-grabbing action for Starting, Swinging, Hoisting and Stopping — you want GATKE High-Heat-Resisting Asbestos Brake Materials.

They are specially engineered and service-proved for all brakes and clutches of Excavating, Road Building and Construction Equipment.

GATKE CORPORATION

224 N. La Salle St., Chicago 1, Ill.



2 Moto-Cranes, with 90' booms lifting a 6½-ton bottle washer to the 6th floor level.

Reg. Trade Mark  
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CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

It's not a MOTO-CRANE unless it's built by THEW-LORAIN



## Fill Up Those Ruts Along Paving Edge

**Minnesota Solves Problem Of Erosion Along Concrete Pavements at Minimum Cost; Special Maintenance Blade**

† THERE is a variety of thought on the methods of eliminating the rut often found along the edges of concrete pavements with dirt shoulders where the pavement width is inadequate for the traffic. Many states, like Minnesota, have a considerable mileage of 18-foot concrete roads built 20 to 25 years ago when this width was considered satisfactory. The presence of a dangerous and unsightly rut along the edges of concrete pavements has caused considerable criticism from the traveling public and immediate correction of this condition under maintenance is essential to eliminate a serious traffic hazard.

Minnesota has given considerable thought to the proper and economical treatment necessary to provide a safe shoulder for traffic until conditions permit the reconstruction of such narrow pavements to provide an adequate width. Since the Minnesota highway system includes 742 miles of 18-foot concrete pavement, most of which carries an excessive amount of traffic for this pavement width, it was essential to find an inexpensive solution for this problem. The following method was considered worthy of trial and since its institution has been found to be both inexpensive and satisfactory.

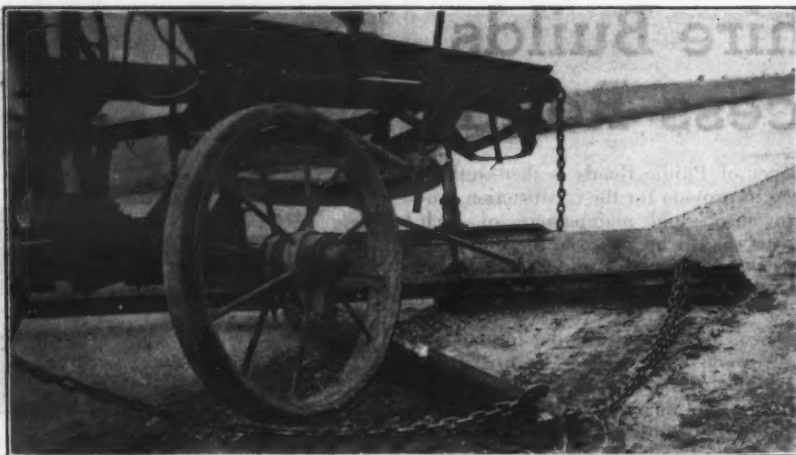
By the use of a specially notched blade attached to a motor grader, a trench 3 feet wide and 2 inches deep is cut immediately adjacent to the edge of the concrete pavement. The dirt excavated is permitted to spill out to the end of the blade and over the edge of the shoulder onto the slope and requires no further handling.

Stabilized gravel is then placed in the trench by truck-dumping, and is bladed, shaped and rolled. The gravel is stabilized economically by dumping clay from nearby pits over the top of the face of sandy gravel being worked, mixing being automatically secured by the loading, hauling, and screening operations. Accepted gravel has a maximum size of  $\frac{3}{4}$  inch and contains about 20 per cent of clay binder. This operation is done principally by contract at bid prices which average \$400 per mile of concrete road.

### Maintenance

A special shop-built drag was designed for the proper maintenance of this gravel-filled shoulder and has worked out well. The drag consists essentially of a trussed frame resembling a letter "A" with the top cut off, made by welding pieces of 1½-inch pipe together. Plates with bolt holes are properly attached so that worn grader blades can be fastened to the sides of the "A". This tool is swung from the right side of a 1½-ton truck, with the cut-off portion of the "A" toward the truck and opposite the cab door. A lever bolted on the right step serves to move the frame away from or closer to the truck, two chains from a cross bar at the front of the truck furnish the pull, and a third chain from the top of the frame near the back is attached to the near corner of the dump body and serves to raise or lower the blades when the truck body is raised by its hoist.

In operation, a short blade attached to the leading side of the "A" and inclined toward the pavement picks up loose gravel and moves it across the shoulder and onto the pavement. The rear blade is much longer and its inner end is bent so as to run parallel to the



One of the shoulder drags used by the Minnesota Department of Highways. Mounted on an old-style grader, the outfit is towed behind a section truck to keep gravel shoulders smooth and in good condition.

center line of the pavement while the blade is pulled at an angle to pick up and respread the gravel over the shoulder. The right rear dual tire is run off

the pavement and acts as a pneumatic roller to compact the gravel which has been disturbed by blading. An extra rudder bar sticks out behind the drag

with a vertical plate set parallel to the pavement and helps to keep the device traveling in proper alignment. The chain attached to the truck dump body is used to raise the entire device clear of the shoulder when a concrete spillway or other obstruction has to be crossed. Operators have become so expert that this work is performed without materially decreasing the speed of the truck.

Since this device can be operated at reasonably moderate speeds, a large number of miles can be maintained in a few hours and, by giving the gravel this attention at frequent intervals, loss and necessary replacement of the original gravel are minimized. The maintenance is therefore as economical as the original construction and, as a result, the dangerous rut has practically disappeared from Minnesota's highway system.

Security from air attack may cause highway engineers of the future to avoid long straight roads which serve as directional arrows to fliers, the Office of Civilian Defense believes.

# KOEHRING HALF YARD

**PLAN NOW  
TO  
OWN ONE**

**New Half-Yard KOEHRING 205**  
has many new features  
for cost-cutting operation

Two-In-One Shovel Boom • Trigger Fast Dipper Trip • Clear Interior Turntable • Independent Traction • Spacious Walk-Around Area • Exceptionally Accessible Machinery • Head Room in All Parts of Cab • Easily Removable Machinery Units • Two Purpose Main Machinery Support • Exceptional Steadiness • Instant Travel Reverse.

**HEAVY-DUTY CONSTRUCTION EQUIPMENT**



## An Army Chain Saw Rides in Mule Pack

The Army Engineers are using a gasoline-engine-driven chain saw for cutting trees, logs, or timber up to 36 inches in diameter in their front-line construction. This pack saw is basically the same as the standard chain saw, the only difference being that it is provided with a special carrying rack to make it suitable for mule pack. Engineer mounted battalions are equipped with this saw for work in areas inaccessible to motor transport.

The throttle and all controls of the saw are located at the power end and are so arranged that all operations are easily controlled by one man. It is automatically lubricated by a device placed in the tail block. The working weight of the 36-inch chain saw is about 100 pounds but it is so well balanced that it is easily operated in any position and will cut through a tree or hardwood log 12 inches thick in about 12 seconds.



A gas-engine-powered chain saw used by Army Engineers for clearing areas at the front. For inaccessible locations, the unit with a supply of gasoline for its operation is pack-mounted, as shown at right.

## Mack Appoints Kauffmann For Diesel Research Post

William M. Kauffmann has been appointed by Mack Trucks, Inc., New York City, as Assistant to the Chief Engineer, supervising the firm's facilities for diesel research and development. During his

twenty years' experience in this field, Mr. Kauffmann has been associated with the Worthington Pump & Machinery Corp., the National Transit Pump & Machine Co., Baldwin De La Vergne Sales Corp., and the National Supply Co. He is a graduate of the Illinois Institute of Technology.

## Traveling-Plant Mix On N. M. Access Road

(Continued from page 2)

was re-formed to proper size on the center line.

### Tack Coat, Mixing and Spreading

The tack coat of MC-1 was applied by a 1,200-gallon Etnyre distributor, mounted on an International truck, in two widths of 14 and 10 feet at a rate of 0.25 gallon per square yard. This was allowed to cure a minimum of 24 hours, or longer if necessary, before the windrow of dry aggregate was bladed across the road onto the completed tack coat, and the application made to the other side of the road.

Moisture in the windrow of aggregate was reduced to 2 per cent or less by blade aeration by the same motor graders, hand-picking of any oversize materials being continued through all blading operations. When the moisture content was reduced sufficiently, mixing was done by a Barber-Greene traveling plant, 5.1 per cent of MC-3 being used. Asphalt was shipped from the Socony Vacuum Oil Co. refinery at Augusta, Kans., to a central distributing point where it was unloaded to three 2,000-gallon and one 1,000-gallon booster tanks, mounted on Chevrolet trucks, which hauled it the approximately 25 miles to the job. Drivers of the booster trucks were paid \$6 for the first load, \$4 for the second, and \$3 for each additional load. The asphalt was delivered to the mixer in trucks owned by the contractor.

Mixing progressed at an average rate of 1 mile per day although curing and spreading the mixed windrow were somewhat delayed at times by bad weather. The same Caterpillar motor graders used for preliminary work on the unmixed aggregate handled both curing and spreading, and compaction was obtained by an 8-ton Buffalo-Springfield tandem roller.

### Estimated Major Quantities

The major estimated quantities on this project were as follows:

Item	Quantities
Excavation, unclassified	21,000 cu. yds.
Rolling, steel-wheel roller	179 hours
Concrete, Class A	439 cu. yds.
Contour ditches	1,900 lin. ft.
Construction and maintenance of detour road	1.1 miles
Pit-run gravel base course	2,191 cu. yds.
Pit-run gravel top course	2,158 cu. yds.
Cut-back asphalt, MC-3	4,551 bbls.
Mixing oil and aggregate	8,959 miles
Grading	6,830 miles
Bridges	
Concrete, Class A, substructure	56 cu. yds.
Untreated timber, substructure	5,116 MBM
Treated-timber piling	784 lin. ft.

### Personnel

Project No. DAWR 53-A-2 for 9.1 miles of access-road construction was awarded by the New Mexico State Highway Department on November 20, 1943, to Martin & Cowart, Albuquerque, N. M., on their bid of \$87,733.90. Herbert Longenbaugh, Superintendent for the contractor, commenced operations on November 23, and the job was completed on April 21, 1944. F. G. Healy is State Highway Engineer of New Mexico and C. G. Grosvenor, District Engineer of the Santa Fe District in which this work was done. Ural Armstrong was Project Engineer for the state.

### Atlas Lumnite Cement Co. Names New Sales Manager

The appointment of Roy T. Giles to the post of Sales Manager has been announced by the Atlas Lumnite Cement Co., U. S. Steel Corp. subsidiary. Mr. Giles, formerly Service Director, became a member of the staff in 1928. Previous to that time, he had been connected with the North Carolina highway organization and the Blaw-Knox Co.

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### Authoritative Booklet On Ditch Dynamiting

Highway engineers and contractors whose ditch dynamiting problems are further complicated by present-day manpower and equipment shortages will find useful information and suggestions in a recently issued comprehensive 32-page booklet on the use of du Pont ditching dynamite. Both the propagation method, applicable only in wet soils, and effective even where the surface is covered

with heavy stumps and 1 to 2 feet of water, and the electric method, for use in wet or any class of dry soil except sand, are discussed authoritatively, with directions for the best procedure in dynamiting ditches for pipe-line and highway construction, flood control, and similar work. The text is illustrated.

Copies of "Ditching with Dynamite" may be obtained by writing directly to E. I. du Pont de Nemours & Co., Explosives Department, Wilmington 98, Del. Just mention this item.

### Faster Lubrication For All Equipment

Time lost in slow lubrication keeps equipment from getting back into the field to earn money. According to the manufacturer, the Lincoln Powerluber, an air-motor-operated high-pressure unit, conserves man-power by speeding up the lubrication of construction and maintenance equipment. It is operated by one man, 60 pounds of lubricant may be placed in the container at one time, and

fast delivery of the lubricant at high pressure shortens the time required for this necessary maintenance operation.

Other features of this unit are illustrated and described in Bulletin No. 201 which may be secured direct from the Lincoln Engineering Co., 2701 Natural Bridge Ave., St. Louis 20, Mo., by mentioning this review.

*The Sixth War Bond Drive is on! Help make this the Victory Drive by buying more War Bonds.*

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The Sawtooth Company, Boise, Twin Falls.

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Chicago Construction Equipment Co., Chicago, Peoria.

**INDIANA**  
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James W. Bell Co., Cedar Rapids.

**LOUISIANA**  
Universal Tractor & Equipment Co., Baton Rouge, Shreveport.

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General Supply & Equipment Co., Inc., Baltimore.

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Parker-Danner Company, Hyde Park.

**MICHIGAN**  
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Contractors Machinery Co., Grand Rapids.  
Straits Engineering Company, Sault Ste. Marie.

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\*Trade Mark Reg. U. S. Pat. Off.





U. S. Engineers Photo  
A novel portable rig for clearing trees,  
used at the Barker Dam site.

## Long Earth Dam For Flood Control

**Barker Dam in Texas Is  
First Unit in Project to  
Protect Houston; Compaction  
By Tractor Equipment**

(Photo on page 88)

† SITUATED in very flat terrain, with so indefinite a separation between drainage areas that the torrential rains occurring at intervals sometimes produce cross flow and serious damage, Houston, Texas, is faced with a problem of flood control which has necessitated corrective measures. Intensive study by the U. S. Engineer Office has resulted in the formulation of a comprehensive flood-control plan, the completion of which will eliminate the menace.

The first step in this program was the construction of Barker Dam, designed to impound flood water temporarily in Buffalo Bayou, the contract for which was awarded to the Macco Construction Co. of Clearwater, Calif., in 1942. This structure is an earth dam, containing 3,474,000 cubic yards of fill, 14 miles in length, with its center line forming a large letter J. The impounding reservoir thus formed has an area of 13,100 acres and a capacity of 90,000 acre-feet. The maximum height of the dam is 39.5 feet, with an average height of 28 feet above the valley floor.

The outlet works of reinforced-concrete construction consist of an intake, five rectangular conduits 7 x 9 feet in section which will permit a maximum discharge of 8,350 cubic feet per second, and a stilling basin. Four of the conduits will remain open at all times, while the fifth may be wholly or partially closed to reduce the discharge by means of two sliding steel gates. No normal flow of Buffalo Bayou will be impounded, as the project is purely a flood-control measure.

Rectification of the channel of Buffalo Bayou to improve its discharge capacity is being completed for 3 miles below the dam as a part of this contract. This rectified channel was then rippedraped for a distance of approximately 1,000 feet below the outlet structure, the work for which will be described in a subsequent issue.

### Grading Operations

A 6-inch depth of surface soil was

stripped from both the dam site and borrow pits by two 12-yard LeTourneau scrapers pulled by Caterpillar RD8 tractors and by one 2½-yard dragline and was stockpiled in continuous windrows on both sides of the borrow pits and dam, to be used later for topsoil blanket.

Borrow pits were excavated on the inside of the reservoir, a 75-foot berm being left between the toe of the dam and the borrow pit. Their 3 to 7-foot depths were established by drainage requirements and their widths of from 175 to 800 feet, by the quantity of material needed for the construction of the dam.

### Placing the Fill

The fill for the dam, which has a 15-foot crown width and 3 to 1 slopes on both sides, was placed by two Bucyrus-Monaghan draglines handling 8-cubic-yard Hendrix buckets on 150-foot booms and three 2½-yard draglines, and was compacted to a minimum Proctor density of 90 per cent. Under existing conditions of moisture, it was usually unnecessary to use rollers to secure this

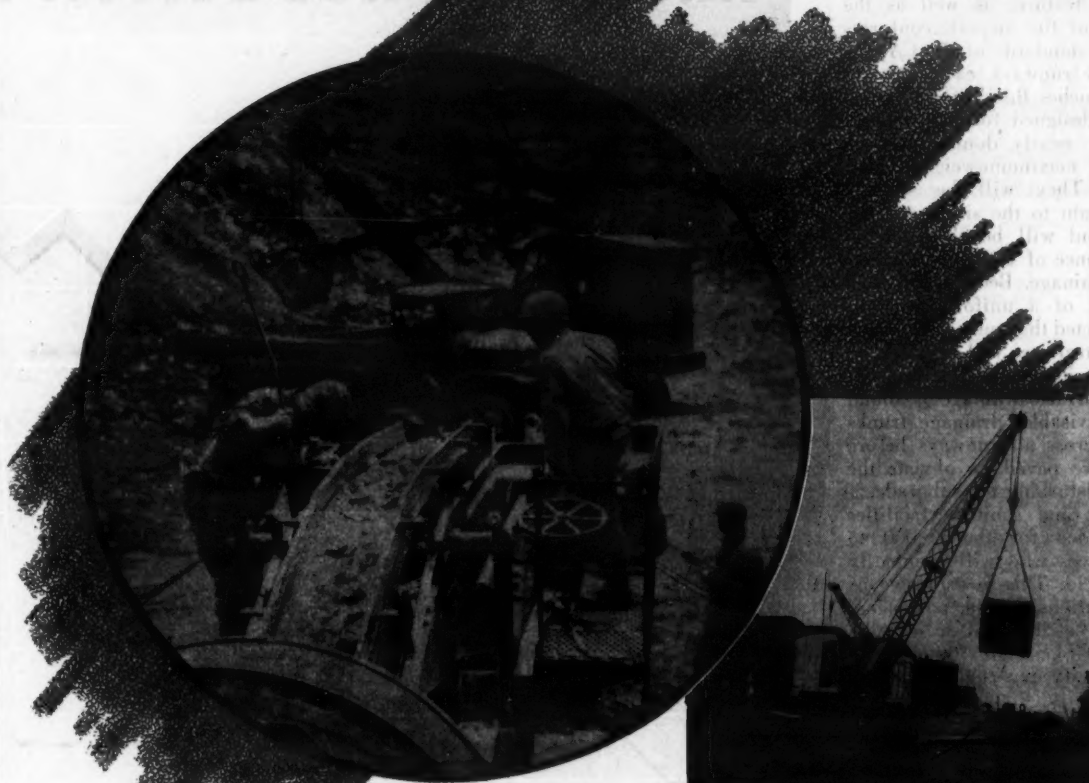


U. S. Engineers Photo  
A portion of the dirt-moving fleet used for stripping at the site of Barker Dam.

compaction, it being obtained solely by the ten Caterpillar RD8 tractors with LeTourneau bulldozers which spread the dirt in 8-inch layers. The average moisture of material excavated ran from

16 to 20 per cent, which was considered optimum. In cases where the moisture content did not permit proper compaction by the tractors, sheepfoot rollers (Concluded on page 35)

# TOTAL WAR—ALLIED VERSION



FRANCE—A 5-ton shovel loads rock for a crusher.  
(Signal Corps Photo)

Fine excavating equipment in the hands of skilled men—the weapon the Axis overlooked—is one of the distinguishing marks of total war, Allied version.

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ENGLAND—A 5-ton shovel loads rock for a crusher.  
(Signal Corps Photo)



SICILY—A 5-ton shovel loads rock for a crusher.  
(Signal Corps Photo)



SOUTH MILWAUKEE, WISCONSIN—A 5-ton shovel loads rock for a crusher.  
(Signal Corps Photo)

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# Planning and Field Work For New York City Airport

(Continued from page 1)

ways. Two of the six initial runways will be 10,000 feet long and the others, 8,200, 7,500, 6,500 and 6,000 feet long, all of concrete 12 inches thick and 200 feet wide, totaling 2,500,000 square yards of concrete when the taxiways and central apron are included. The taxiways will also be 12 inches thick but only 100 feet wide. The 12-inch hangar aprons will have an area of 30,000 square yards of concrete each. The central loading apron and administration area will cover 306 acres. Ten taxiways will radiate from the administration building plaza to give quick access to the ends and mid-point of each runway.

The area surrounding the airport is controlled for a radius of 2 miles in all directions by city zoning regulations, and in some cases by the actual purchase of land to permit full control by the city. This insures the protection of all aircraft by establishing a definite area free of all obstructions on a 40 to 1 flight angle from the perimeter of the airport. This feature, as well as the entire design of the airport, conforms to the highest standards of the CAA.

The concrete runways, each 200 feet wide and 12 inches thick of reinforced concrete, are designed for use by 150-ton planes, or nearly double the size of our present maximum-weight 85-ton war planes. They will be slightly crowned to drain to the sides, and the adjacent ground will be sloped 1 on 100 for a distance of 150 feet on either side to aid drainage. Because the field is being built of a uniform dredged sand, it is expected that runway drainage outside the central area will be absorbed in the pervious inter-runway areas, but just in case surface drainage is found later to be advisable, drainage trunks will be laid across all runways before the runways are paved, to obviate the necessity for disturbing the subgrade.

Office, shop, and sanitary facilities will be provided for the 30,000 to 40,000 employees who will eventually work at the field. This is exclusive of the accommodations for the passengers who will arrive at the field on, or take off in, the 900 planes of 100-or-more-passenger capacity expected to operate

daily to and from the field in the 15 daylight hours, to say nothing of the thousands of visitors who will meet planes or see friends off or just go sight-seeing.

## Field Engineering

On April 17, 1942, soon after the city took over the project, the triangulation of the initial 2,000 acres was started under the direction of the Field Engineer. The whole area was laid out on a coordinate system to conform with that of the Borough of Queens, in which the field is located. Then it was cross-sectioned and staked at 100-foot intervals both ways with necessary intermediate readings. This work was completed in 60 days by three engineering parties of four men each. Then the alignment and location of the runways

and taxiways were all coordinated and all the intersections precisely computed and coordinated. The position of the discharge lines of the dredges is recorded on the engineer's map every night and plotted on a record map for future reference.

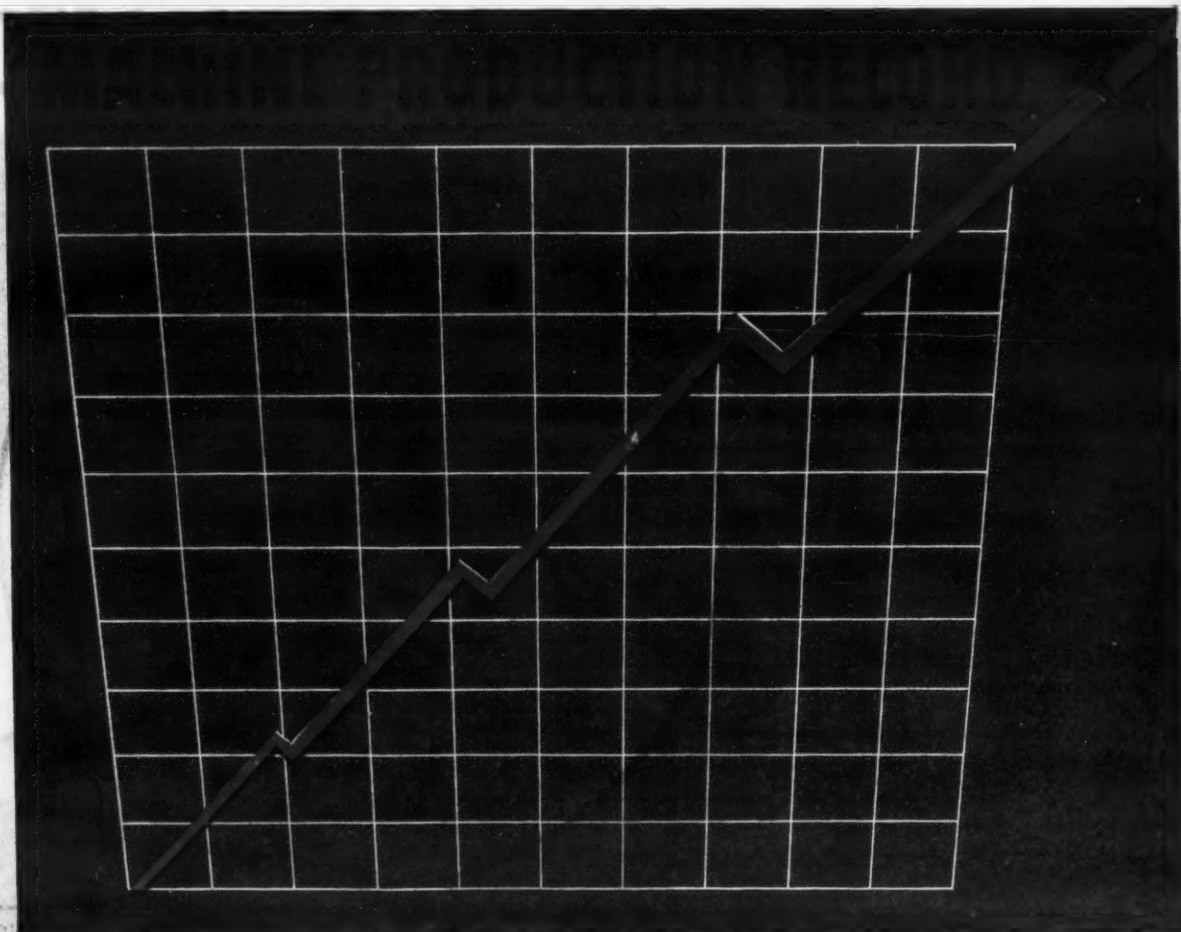
Exploration of the entire area was undertaken, and nearly 300 structures, including many houses, as well as shacks, had to be removed to clear portions of the site, before the fill was started. The section is an old glacial area covered with small meandering streams and is bordered with muck carried by these streams into the bay. The site was covered with a meadow mat of coarse vegetation from 4 to 7 feet thick with some muck and underlaid by a shallow but variable layer of gray sand over a thick layer of brown sand. About 40 borings well distributed over the area to be filled were made through the gray sand into the brown, in addition to some 150 probings. The borings averaged 25 feet deep, while the probings were only 8 to 10 feet through the

meadow mat. The dredged sand fill over the meadow mat varies from 7 to 10 feet thick, although the fill placed under the Army contract is 12 feet thick. The excess in the Army fill is to be graded off and used for fill in adjacent areas now being filled in by the city.

During the placing of the dredged fill the Engineering Department established test settlement plates, located test borings, and established a system of water wells to note the fluctuation of the water table over the entire area. At the request of the Public Roads Administration, the Consulting Engineer will put down 2-inch observation wells to secure ground-water readings beneath the pavement areas. These wells will be left in place, flush with the runway pavement, to permit later exploration of the ground water.

The entire area has been cross-sectioned at the end of each month for the monthly estimates and again at mid-month at 100-foot intervals to detect the behavior of the subsidence of the

(Concluded on next page)



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## Airport at Idlewild Under Construction

(Continued from preceding page)

material. The monthly estimates were all made from precise computations. It was estimated at the start of operations that the subsidence of the fill would continue for a period of six months, but it has uniformly reached a static condition in four months.

### Construction Contracts

The contracts awarded by New York City thus far are:

Contract No. 1 for 16,000,000 cubic yards of hydraulic fill, at an estimated cost of \$3,198,400, awarded to Gahagan Construction Corp., New York City, on April 21, 1942, and a supplemental agreement under Contract No. 1 for 7,000,000 additional yards of hydraulic fill, made with Gahagan on May 13, 1943. Both of these jobs are completed.

Contract No. 3 for grading and the planting of beach grass, awarded to Peter Mitchell, Inc., of Greenwich, Conn., and D. T. Small, Inc., White Plains, N. Y., on June 10, 1943. The cost of this work, which is also completed, was approximately \$247,500.

Contract No. 4 for hydraulic fill was divided into two parts, 3,000,000 cubic yards being awarded to the Gahagan Construction Corp. at a cost of \$694,500, and 3,500,000 cubic yards to the Atlantic Gulf & Pacific Co., New York City, at a cost of \$556,000, both on January 6, 1944. This work has been completed.

Contract No. 5, for 8,500,000 cubic yards of hydraulic fill and demolition, at an estimated cost of \$1,926,950, awarded to the Atlantic Gulf & Pacific Co. on August 15, 1944. This work is now going on.

Contract 6 for grading the runways and central area, involving 2,500,000 cubic yards, at an estimated cost of \$725,000, awarded to the Circle Construction Corp., White Plains, N. Y., on August 19, 1944, and now under way.

Contract 7, for 570,000 square yards of concrete paving on runways A, B, and C, awarded on September 26, 1944, to A. I. Savin Co., East Hartford, Conn., on its low bid of \$2,203,945.

### Access to Airport

Van Wyck Boulevard, the major access road to serve the airport, is to be reconstructed by the city from Queens Boulevard to Southern Parkway, the northern boundary of the field. This will be a six-lane mixed-traffic expressway with three-lane local service roads on each side. At its terminus on Southern Parkway, it will feed into the airport system of service and express roadways.

Other means of reaching the site are contemplated by the Long Island Railroad, which has a 4-track branch line within 1½ miles of the airport. This would provide transportation to Pennsylvania Station in New York City in 20 minutes, while over the 13 miles of

highway it will take about 29 minutes to reach Grand Central Station in Manhattan via the new Queens-Midtown Tunnel.

### Personnel

The design and construction of the municipal airport for New York City

at Idlewild, L. I., are under the direction of Jay Downer, Consulting Engineer, with Wharton Green, Associate Engineer, and E. J. Carrillo, Field Engineer. The architects for all buildings are Delano & Aldrich, New York City.

The contracts for the construction are awarded by John McKenzie, Commis-

sioner, Department of Marine and Aviation, who is in charge of the construction and operation of the airports owned by New York City.

Best hopes for relief in the tire shortage—intensified conservation, and the end of the war!

# FLOAT FINISHING Mechanized



## JOHNSON FLOAT FINISHER



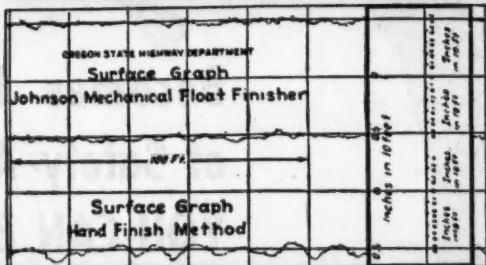
READY FOR EDGING and jointing! That's the way the Johnson Float Finisher works. It duplicates the action of the hand float or trowel. Has a troweling surface of more than 8000 square inches. It cuts off the high spots...fills in the voids...consolidates the mortar...and with mechanical efficiency leaves a finished surface with a variation of .05 inch, or less, in 10 feet—better than any state highway specification requirements.

You get speed, too, with the Johnson Float Finisher. Roy Houck, Oregon contractor, finished 3065 lineal feet in an 8-hour day. Mountain States Construction Company finished 6.37 miles of 22-foot highway in 33 days. These reports are not necessarily "top speed" for the Johnson Float Finisher—its capacity is far greater than present day requirements.

Write for catalog! You'll want to know about the easy adjustments to all highway curves from the vertical to the transverse spiral; the accurate control features; the motive power; the water supply tanks, and many other features.

**MADSEN IRON WORKS**  
HUNTINGTON PARK, CALIFORNIA

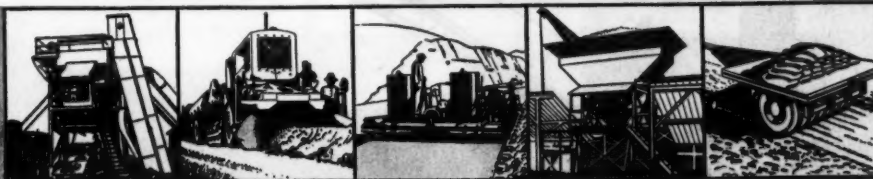
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SHOWS IMPROVEMENT UPON  
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The new White front-end loader for International I-6 and ID-6 tractors.

### New Features Added To Front-End Loader

A new front-end loader for use with International I-6 and ID-6 wheel-type tractors has been announced by the White Mfg. Co., Elkhart, Ind. This latest addition to the line of White loaders embodies the features of extensible booms and mechanical power take-off from the front of the tractor engine.

The extensible boom arrangement is exclusive with White units. It places the bucket close to the tractor when digging, but when the bucket is raised it moves outward, as well as upward, and discharges 2 feet ahead of the digging position. This permits loading into high standard truck bodies and spreading of material without hand shoveling.

The bucket can be held or dumped at any point in its lift; it can also be removed and a bulldozer blade attached. The bucket is made in  $\frac{3}{8}$ ,  $\frac{1}{2}$  or  $\frac{5}{8}$ -yard sizes, with a  $\frac{3}{4}$ -yard bucket for light materials such as snow, coal, or light chemicals.

In addition to the new loader for the I-6 tractors, the White loader is made for International 20 and I-30 tractors already in service. It is also furnished for Case tractor models CI and DI, and for Minneapolis-Moline Model UTI tractors.

Complete information and prices of this new White front-end loader may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

### New Pamphlet Describes Use of Hard-Facing Rods

The economy and advantages of hard-facing the wearing parts of machinery and equipment, to protect them against abrasion, corrosion and erosion, are discussed in an attractive new pamphlet issued by the Haynes Stellite Co., Kokomo, Ind. Typical parts which can be so hard-faced are listed, a few are illustrated, and the pamphlet states that there are literally hundreds of applications where this treatment can be employed to reduce maintenance costs and prolong the service life of crushing-machinery parts, dipper and dragline bucket lips, mixer blades, tractor treads, et cetera. It is also stated that the manufacturer is equipped to apply these abrasion-resistant cobalt-chromium-tungsten alloys quickly, efficiently, and at moderate costs.

Copies of the pamphlet "Cut Costs With Haynes Stellite Hard-Facing Rods" may be secured by writing on your official stationery direct to the company and mentioning this item.

### 90 Second Batching Cycle JOHNSON Streamline PORTO BATCHER



**Batches Faster,  
Easier, Cheaper and Is  
Completely Portable**

**7** points of profitable batching advantage in the Johnson Porto Batcher, the mixing unit that goes right to the pouring area.

- 1 A complete highway portable batching plant that is towed to location by an ordinary truck.
- 2 A 5 cubic yard truck receiving hopper and a 90 ton per hour aggregate elevator handles the material from dump trucks to bin storage.
- 3 Bin capacity 45 tons, arranged for 2 truck loads in each compartment.
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- 5 Operating control levers are grouped in one central location. One man controls all batching operations.
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- 7 Designed for batching into truck mixers, stationary mixers or paver batch trucks.

Write us today about your mixing problems and how the Porto Batcher may save money and time for you. Full information free. Our engineers are at your service.

READY MIX PLANT  
BULK CEMENT HANDLING  
EQUIPMENT  
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CONCRETE BUCKETS  
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THE C. S. JOHNSON COMPANY  
Champaign, Illinois

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# Highway Economics For Town and County

## Bonds to Make Possible Protection of Original Investment More Sound Than Pay-As-You-Go

By B. C. McCURDY, Superintendent of  
Highways, St. Clair County, Ill.

† FIVE years ago, the officials of one of the smaller townships in St. Clair County, Ill., made a study of ways and means of increasing their roads funds. The total annual revenue was less than the amount required for efficient operation, and the funds per mile fell far short of the amount needed to repair and preserve existing roads and bridges. There was no surplus available for betterments, although there were opportunities to secure real assistance if the towns supplied even a fraction of the cost.

Two methods of securing more money for roads were presented, each requiring an election. It was pointed out that a bond issue was needed and justifiable, the alternative being to double the tax rate for five years. One commissioner decided in favor of proposing the additional tax, influenced by the nearness of the time he must stand for reelection and his awareness of the distaste of the people for interest-paying. The tax plan was carried, but the commissioner was not reelected.

These town officials are once more faced with the problem of financing their roads but, on the basis of past experience, they are now ready to go to their people and tell them that the only sure and fair way to handle the situation, which has become worse instead of better, is to borrow enough money to make lasting repairs and make those betterments to their roads and bridges which will reduce maintenance costs below their income. These officials are painfully aware of the fact that it is an injustice to a taxpayer to pay for repairs from which he can secure no benefits, while he waits for his turn for real improvements. The sight of neighboring towns who put their finances in order and are now enjoying the benefits has made these people determined that they will not miss the boat the next time there is an opportunity of improving the quality of their roads.

The only difference between that township and its small affairs and most of the counties and the states is size. The time has come for a thorough reexamination of highway economics, based on conditions as they are and not as they were or as they perhaps should be.

### Logistic Economics

Before we begin to evaluate the advantages that may accrue from the improvement of a particular road, we should recognize at the outset the essential differ-

ence between improvements which reduce the overall cost to the public agency in charge, and the savings which will accrue to the user of that highway. We can unhesitatingly apply 100 per cent of the reduction in maintenance costs toward amortizing the outlay for such improvements, whereas only in the case of toll roads is it logical or equitable to consider 100-per cent of the highway users' savings as being applied directly to the retiring of the first cost of the improvement. The percentage of such highway users' savings which may properly be used in our computations diminishes as we pass from trunk highways to secondary and land-service roads. It might be argued that if funds received from motor-vehicle taxes are used it would be proper to credit the improve-

ment with all of the savings, but this is only partially true since uniform taxation invariably results in an unbalanced ratio of taxes paid to benefits derived.

A prime opportunity for the application of these principles lies in the field of secondary-road development. In our desire to extend the benefits of improved roadway surfaces as far and wide as the funds in our hands would permit, many miles of traffic-bound stone and gravel roads have been built. Little or no consideration was given at the time to setting aside or providing the necessary sums to maintain and preserve the value and usefulness of the outlay. Too often maintenance is considered to end with smoothing out the ruts, and the tremendous loss of road metal which is blown, eroded or dissolved away is ignored until the base is so thinned and weakened that it must be almost completely rebuilt.

The loss of limestone due to its being dissolved probably exceeds the loss due to dusting and is almost unnoticed. It is forgotten that the farmer along our roads hauls tons of limestone dust onto his

fields for the purpose of having it dissolved. Probably the annual loss of stone in an untreated traffic-bound road is not less than 5 per cent of the weight of the stone remaining in the roadway in any one year, which means that in about 13 years one-half of the original weight of stone has been lost. It is safe to say that in some instances the total losses run as high as 10 per cent, that is 100 tons per 1,000 tons of stone.

### Stopping Loss of Road Metal

This bankrupting loss can be forestalled by applying a binding and waterproofing treatment, varying from a dust palliative or road oil to a skin-thick surface treatment or a low-cost bituminous surfacing course. The type is determined by the law of diminishing returns. For an example (bearing in mind that the costs quoted are neither actual or typical, but simply demonstrate the method of calculation), consider a mile of traffic-bound road 18 feet in width, constructed with 1,500 tons of stone per

(Concluded on page 38)

## IT COSTS LESS TO CLEAR MORE WITH WALTER SNOW FIGHTERS

### HERE'S WHY:

#### GREATER CLEARING CAPACITY



Powerful Walter Snow Fighters get maximum results from the biggest plowing equipment. Equipped with V Front Plow and Side Wings, the 250 H.P. model clears a 28 ft. width in one run—a two-lane road in one round-trip!

#### FASTER PLOWING SPEEDS



The unmatched traction provided by Walter Four-Point Positive Drive eliminates slipping, stalling and wheel-spinning — keeps Walter Snow Fighters charging ahead at speeds unequaled in the field of snow removal.

#### FEWER TRUCKS NEEDED



This speed and capacity produce a remarkable volume of snow removed per hour—enabling you to cut costs by using fewer trucks to cover your routes.

#### LOWER MAINTENANCE AND FUEL COSTS



Fewer trucks to service means lower operating costs—takes a big load off garage facilities normally strained by winter breakdowns.

In highway budget arithmetic, Walter Snow Fighters' faster clearance means lower-cost-per-mile. And in the eyes of the taxpayers, it means a more thorough job of snow removal. Road-blocking drifts are speedily cleared. Snow is removed before it packs and freezes into dangerous ruts. Main highways are completely widened-out. More miles of secondary roads are opened.

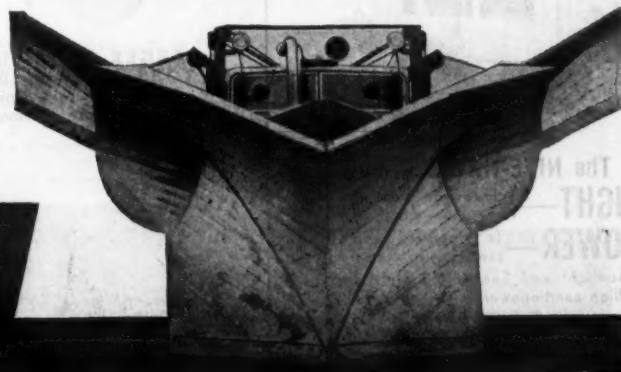
The outstanding power, traction and speed provided by the exclusive Walter Four-Point Positive Drive is the key to this performance. Three automatic locking differentials proportion power to each of FOUR driving wheels according to their traction at any instant. No wheel shirks, every wheel works!

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There's a real engineering story behind the exceptional record of Walter Snow Fighters. Write today for detailed literature.

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**THE PINOLA COMPANY**  
Savannah, Georgia



## Michigan Organizes For Winter's Snows

(Continued from page 7)

drivers can be provided to haul the snow, with the municipality furnishing the loading and other labor.

A comprehensive system of securing information on adverse road conditions has been established by the Department. The maintenance superintendent of each county arranges with the night patrolman and with owners of all-night gas stations, restaurants, and other available sources to report by telephone to the maintenance garage the weather and road conditions in their neighborhoods. The maintenance superintendent then telephones this report to his District Office. The District Office then relays this information to the Maintenance Division in the main office at Lansing. There are nine districts in Michigan, including the metropolitan district around Detroit, and the timing of the calls is staggered so that a complete report from all the districts is obtained within one hour. A brief résumé of these reports is then sent to all district offices where it is also adapted for public use. These reports cover the time of observation, inches of snow, temperature, weather, road conditions, visibility, progress of sanding, roads limited to single-lane traffic, roads blocked, and expected time of clearance.

The Maintenance Division obtains from the U. S. Weather Bureau at East Lansing a routine weather forecast each Tuesday and Friday at 2 p.m., supplemented by additional reports in case of a storm. This is telegraphed or telephoned to the district offices.

The night patrol is the "Paul Revere" of the Maintenance Division. During periods of expected storms, patrol work is done by an equipment operator who notifies the superintendent or foreman if, in his judgment, weather conditions warrant action. Only one supervisor is called out, for the supervision as well as working crews is staggered in order to avoid fatigue. Dual crews are used in which trained maintenance employees are fairly equally divided. Both equipment operators and laborers are assigned to each crew which is augmented with extra or casual help as needed. Each crew reports on alternate days until the emergency is over. In these periods the working day is 24 hours long.

### Equipment Used

In the summer and fall, well before equipment is needed, trucks are placed in good working order. Then, as win-



One of the serrated blades, on a Walter truck, used by Michigan to score ice prior to the application of abrasives.

ter comes, snow-plow frames are mounted on the trucks, hoists are tested, snow-plow shoes and cutting edges are put in readiness, chains are stored on the truck or mounted on the wheels as necessary,

and plow trucks may be loaded with  $1\frac{1}{2}$  yards of chemically treated sand to improve traction during plowing operations. Large trucks, Snogos, power graders, and bank slicers are placed at

strategic stations for quick movement against sudden storms that may occur.

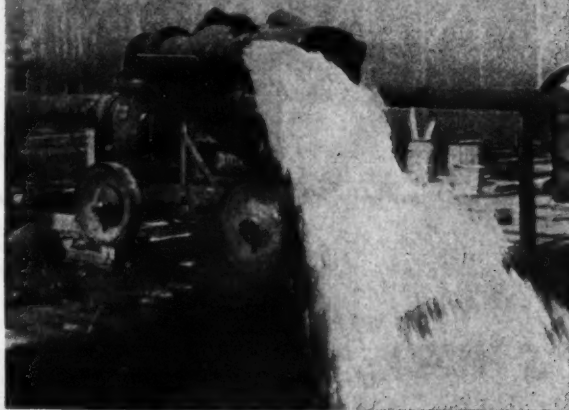
After  $\frac{1}{2}$  to 1 inch of snow has fallen, and if a continued snowfall is anticipated, trucks equipped with under-body blades using conventional curved cutting edges are placed in operation on the traveled roadway to remove the snow before it becomes packed by traffic. These units are kept working during a continuous snowfall up to the time the snow becomes too deep for their effective operation. At this time, light trucks equipped with side-delivery blade plows are sent out and are kept in operation until the storm has subsided, or until sufficient snow has accumulated to require the use of heavy trucks equipped with side-delivery plows, or light trucks equipped with V-plows. If the intensity of the storm is such that the above equipment is inadequate, heavy trucks equipped with V-plows, or Snogos, go into action.

After the storm has abated, operations are continued until the snow is removed

(Continued on next page)

## LOOK AHEAD WHEN YOU BUY

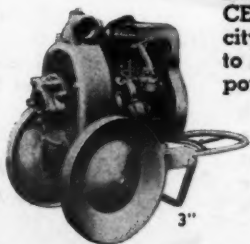
Guaranteed performance is minimum performance for JAEGER "Sure Prime" PUMPS



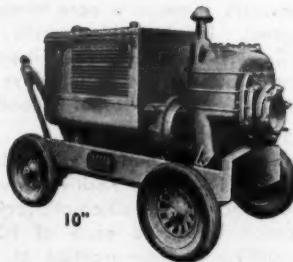
3000 Gallon "Bantam"

Contractors who watch their costs know there's a big difference between a Jaeger "Sure Prime" and an ordinary pump of the same size and rating. Jaeger Pumps are built to exceed their promises—deliver their rated capacity under tougher conditions, prime unfailingly and up to 5 times faster, assure you of thousands of extra hours of dependable cost-cutting service during the post-war building years ahead.

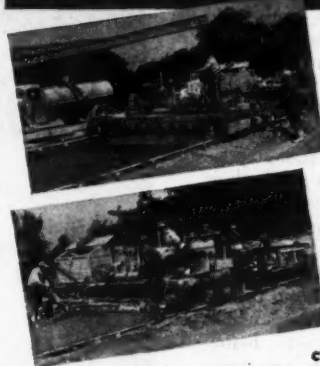
INDIVIDUALLY TESTED AND CERTIFIED for vacuum, capacity and pressure. Sizes  $1\frac{1}{2}$ " to 10"; gas, electric or diesel power.



JAEGER DISTRIBUTORS in over 100 cities, sell, rent and service "Sure Prime" Pumps.



## Air-Entraining Cement REQUIRES QUICK FINISHING by JAEGER PAVING "TEAM"



Here's how "Construction Methods" describes the problem of the Horvitz Co. in laying 187,000 sq. yds. of vinsol resin cement behind a 34E dual drum paver on Ohio Route 237:

"The air-entraining cement produced a concrete which was almost free from surface bleeding, thus providing little water for lubrication during finishing. It was necessary to finish the concrete promptly, before the surface would become too dry, and this fact caused the finishers to work closely behind the mixer, avoiding long overtime at the end of the day and permitting the curing compound to be applied early to the slab. Prompt finishing was of particular advantage in the cool fall days.



### JAEGER SCREW SPREADER and FINISHER—the team that broke the bottleneck behind the paver

When Jaeger originated and developed the mechanical Screw Spreader and Finisher as a paving team, modern paving became practical. Today contractors are able to operate one and even two 34E dual drum pavers, producing the stiffest vibratory mixtures or quick drying air-entraining cement, because of the almost unlimited capacity available for spreading and finishing behind the pavers.

Pavements and airport runways have also gained in strength and smoothness. Screw spreading eliminates segregation and produces a more uniform and denser slab texture; the Finisher, when working behind the Spreader, can concentrate on producing an accurately finished surface.

THE JAEGER MACHINE COMPANY  
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Write for Bulletin 161  
**LISTER-BLACKSTONE, Inc.**  
1706 So. 60th Street MILWAUKEE, WIS.



## Meeting Ice Problem On Michigan's Roads

(Continued from preceding page)

beyond the outer edge of the shoulder. For the sake of appearance, straight-line plowing is followed as far as practicable. When the snow banks along the shoulder become high enough to cause drifting, they are pulled in with bank slicers and the snow is then thrown out with speed plows or Snogos. Snow banks are not pushed or "bulldozed" out as this tends to create a higher bank farther out on the shoulder which will cause drifting snow to accumulate on the roadway.

After snow-removal operations are completed, all road signs are cleared and made visible. If snow equipment is operated against the normal traffic direction, a flagman is always on duty. V-plows are not used for clean-up work as these trucks travel at a high rate of speed and throw snow in both directions. This causes an unnecessary hazard to traffic.

### Ice Control

Another pre-season preparation, prior to the first ice formation, is the strategic placing of containers or barrels for storing ice-control abrasives. They are placed only where the use of such abrasives by the public has shown them to be desirable. For removing the abrasive, each barrel is equipped with an improvised utensil made by shearing in half diagonally a one-gallon tin can. Barrels are placed from 8 to 10 feet from the traveled portion of the roadway.

If packed snow remains on the surface of the road after the plowing operations, an ice hazard will develop. To neutralize an ice condition, the Maintenance Division prefers a coarse heavy sand; cinders also make a satisfactory abrasive. Calcium chloride is incorporated and thoroughly mixed into the abrasive used for ice control at the time the stockpiles are made. From 50 to 100 pounds of calcium chloride per cubic yard is used. Completed stockpiles are given a light dusting of calcium chloride to prevent surface freezing. Before applying the chemically treated abrasive to the road surface, additional calcium chloride is added, if necessary, to meet existing temperatures and ice thickness so that the abrasive is effectively embedded.

Mechanical sanders towed by trucks are used for spreading the abrasives. The ice or packed snow may first be scored by light pressure with serrated under-body blades on trucks in order to concentrate the chemicals or abrasives on the road surfaces. Salt is never placed on concrete pavements, either with or without abrasives. Michigan has found that calcium chloride must be mixed with an abrasive before it is put on concrete paving; otherwise serious scaling will result.

In removing sleet or thin ice from concrete pavement, the immediate application of chemically treated abrasive is made at the rate of 2 to 3 yards per mile

as the ice forms. This is repeated as often as necessary if the sleet storm is protracted or the ice recurs before the next step is accomplished. Ice deposits or accumulated abrasive are peeled off by means of conventional curved blades as soon as the temperature or the action of the chemical in the abrasive loosens the ice from the surface of the road.

For removing sleet or thin ice on black-top, pure sodium chloride or calcium chloride is used at the rate of 500 to 700 pounds per mile. The chemical is spread in a strip about 12 feet wide down the center of a two-lane highway. The curved blades are then used as on the concrete pavement.

When sleet or thin ice forms on gravel, serrated blades are used immediately to score the surface. In some cases this brings enough gravel on top of the ice to control skidding. If this is insufficient, sodium chloride or calcium chloride is applied at a rate not to exceed 700 pounds per mile and the surface, if necessary, is re-scored by the serrated blades.



Icy highways are made safe for winter travel in Michigan by applying sand treated with calcium chloride by means of motorized spreaders.

A thick ice or frozen slush on concrete pavements is removed by first scoring

the surface with serrated blades in order to concentrate abrasives on the road, and then applying chemically treated abrasives in the same manner as for thin ice. At the first opportunity after the ice deposit loosens from the road surface, the pavement can be cleared with the conventional curved blades.

A black-top pavement may be freed from thick ice or frozen slush in the same manner, except that pure sodium chloride or calcium chloride not to exceed 700 pounds per mile is used. Abrasive material may be applied also if required.

Gravel roads are treated the same as black-top surfaces in the removal of thick ice or frozen slush except that the final blading with conventional blades may be omitted at the superintendent's discretion.

### Removing Hard-Packed Snow

Hard-packed snow on concrete, black-top or gravel is treated the same as thick ice or frozen slush on the respective

(Concluded on page 47)

## YOU CAN DEPEND ON LA PLANT-CHOATE "Know-How" FOR THE BEST IN TRACTOR EQUIPMENT

When it comes to developing new and better tools for your post-war jobs remember—no other manufacturer in the tractor equipment field can match LaPlant-Choate's 33 years of pioneering leadership. This record is your best assurance of tomorrow's best buys in tractor equipment.

LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Ia.

1911—LaPlant-Choate started out as a partnership between E. W. LaPlant and Roy Choate—manufacturing horse-drawn stump pullers and house moving equipment.

1919—Introduced a line of trailers with solid disc steel wheels for hauling logs, heavy machinery, etc.

1922—Began manufacturing steel dump wagons with disc steel wheels for hauling dirt behind tractors.

1923—Developed the first tractor-mounted bulldozers to be manufactured on a commercial scale. Original models were hand operated and mounted on Holt and Best tractors, which preceded "Caterpillar".

1924—Introduced a small two-wheeled hydraulic operated carrying scraper with disc steel wheels for operation in tandem behind tractors.

1925—Developed the first hydraulic operated bulldozers to be produced on a production basis. Also the first tractor-mounted snow plow with both the "V" and wings hydraulically controlled. Became the first company to build earthmoving and snow removal equipment for use exclusively with "Caterpillar" tractors.

1927—Business incorporated April 5, 1927. Introduced a dozer with an angling blade for side casting material.

1929—Introduced a dozer with a tilting blade. Also developed a small hydraulic operated roll-over scraper (Fresno type).

1934—Originated the first front mounted hydraulic pump for use with "Caterpillar" tractors in operating dozers, scrapers and snow-plows.

1935-37—Pioneered the first hydraulic operated brushcutters, treedozers, rootcutters and weed eradicators for clearing waste land. Also began manufacturing two-wheeled hydraulic operated scrapers on rubber tires. Introduced the first positive forced ejection hydraulic scraper ever built.

1938—Developed the first successful cable operated carrying scraper to utilize the principle of simultaneous operation of gate and apron in loading and unloading. Also introduced a line of cable operated dozers, rippers and sheepfoot tamping rollers.

1940—Pioneered the first scraper to dig, carry, dump and spread by means of single valve and jack arrangement. Also developed the first practical inside frame dozer.

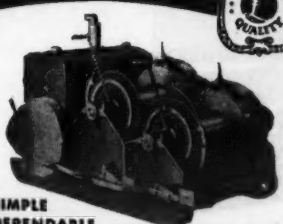
1941—Introduced the first hydraulic operated scrapers for use with "Caterpillar" high speed rubber tired tractors.

1942—Originated the first airborne bulldozers and scrapers to be flown in Army transport planes.

1943-44—Became the nation's largest producer of dozers for the armed forces; pioneered first Beach-Dozer and first Tank-Dozer, in cooperation with U. S. Army Engineers and Ordnance.

NOTE: LaPlant-Choate now controls over 120 patents and applications covering both hydraulic and cable operated tractor equipment.

### STERLING HOISTS



SIMPLE  
DEPENDABLE  
RUGGED—WRITE FOR LITERATURE

STERLING MACHINERY CORPORATION  
105 Southwest Blvd., Kansas City





Goodyear's new synthetic-rubber and rayon-fabric off-the-road tires in heavy-duty service.

## Off-the-Road Tires Of Synthetic Rubber

Users of pneumatic-tired construction equipment for off-the-road service will be interested in the announcement by the Goodyear Tire & Rubber Co., Akron, Ohio, that production of off-the-road tires with synthetic rubber and rayon has started. Both of these materials are new in the construction of this type of tire. The introduction of the synthetic-rubber content arises out of government regulations due to the shortage of crude rubber. Use of rayon will provide greater resistance to bruising and offers greater service possibilities than otherwise. Previously rayon fabric was used only to a limited extent and in specialized cases.

In making the changeover to synthetic rubber for large-size tires for construction equipment on such jobs as earth and rock moving, Goodyear has engineered the internal construction to get the best balance from synthetic rubber and rayon fabric. The placement of the crude rubber is distributed throughout the tire to secure the greatest possible advantage, it is stated.

The government has authorized the manufacture of off-the-road tires, using approximately 35 per cent synthetic rubber and 65 per cent natural rubber. This construction is designated as "S-7". The off-the-road tire is one of the last types to go to synthetic rubber. Government authorities realized the importance of these tires in the construction of airfields and in military operations. As a result, the conversion to synthetic rubber was held up until adequate field tests could be conducted.

Goodyear will produce its Earth-Mover All Weather, Sure Grip and Hard Rock Lug tires with this synthetic-rubber construction. A large number of field tests have been conducted by Goodyear with these tires and good results have been obtained.

Further information regarding these synthetic-rubber-content and rayon-fabric off-the-road tires may be secured direct from the manufacturer by mentioning this news item.

## The Complete Story Of Chicago's Subway

Starting with a short history of the planning and construction of Chicago's first subway, written by Philip Harrington, Commissioner of Subways and Superhighways, City of Chicago, Ill., Part II of the Journal of the Western Society of Engineers for June, 1944, is devoted entirely to papers on this great midwest project.

The titles of subsequent papers published in the Journal include: Federal Government Participation; Design and Engineering; General Layout; Structural Design; Construction of Tubes and Stations; Alignment and Track; Electrical Equipment; Mechanical Equipment; Installation of Track and Equipment; Construction of Inclines; Architectural Treatment of Public

Areas; Architectural Design and Finish; Testing and Inspection of Materials and Equipment; Materials and Priorities; Building Examination; Subway Operation; and a partial bibliography of other papers on the construction of the Chicago subway. (See also C. & E. M., January, 1940, pg. 24).

## New Hyster Promotions

Several important executive personnel changes have been announced by the Hyster Co., Portland 8, Ore., and Peoria, Ill., manufacturer of hoist equipment for use with Caterpillar track-type tractors and a line of industrial trucks. Philip S. Hill, who has been Assistant Manager of the Hyster Eastern Division at Peoria, returns to Portland as General Sales Manager. Glen M. Ede becomes Assistant Manager of the Hyster Industrial Truck Division. C. B. Bamberg, formerly Assistant Purchasing Agent for four years, has been made Purchasing Agent, and B. G. Nordling has been made Manager of the Parts Department.

## PREVENT COLD WEATHER DELAYS ON CONCRETE JOBS

Use

**SOLVAY CALCIUM CHLORIDE**

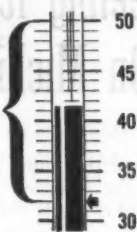
FOR SPEED, EARLY STRENGTH AND EXTRA PROTECTION

Concrete construction work this winter can proceed without delays despite cold weather or sudden temperature drops. Wasteful, costly waits between operations for re-use of forms can be cut . . . the protection period can be reduced. SOLVAY Calcium Chloride added to the mix doubles the strength normally developed during early periods . . . overcomes slowing effects of low temperatures . . . permits re-use of forms and quicker finishing and use of concrete. It does not change the normal chemical action of portland cements, and makes for a denser, stronger, more waterproof concrete.

Write for FREE booklet—"Calcium Chloride and Portland Cement."

Address Dept. 94-11.

SOLVAY SALES CORPORATION, 40 Rector Street, New York 6, N. Y.



*When a crane takes a vacation...*

**IT'S EXPENSIVE**

Whether your crane rolls on wheels or crawls on treads, it's a big, powerful, friendly brute that's as willing as a St. Bernard dog—and even more responsive.

But, without those sinewy ropes on its various lines, the big fellow couldn't do a thing. So it's money in your pocket to see that the *right* ropes are there in the first place—ropes that stand up to the wear and tear and grief imposed by heavy loads and bending stresses.

By right ropes, we mean Purple Strand of the proper construction for this sort of work. When you buy Purple Strand, you're getting the toughest steel that ever goes into the making of rope—steel from selected heats that are closely controlled and supervised every step of the way by Bethlehem metallurgists. Purple Strand means premium quality from crown wire to core.

For hoisting, holding, and closing lines, you'll find that it pays to use Purple Strand Form-Set (preformed). The preforming process takes the "wildness"

out of a rope; makes it easier to bend around sheaves, and facilitates spooling. Even more important, it adds life to the rope by making it more flexible—hence less susceptible to bending fatigue.

That crane can be a mighty good friend when you need to move big loads in a hurry. If it's reeved with Purple Strand, you'll keep it on the job a lot longer.



**When you think WIRE ROPE . . . think BETHLEHEM**



# Runways Reinforced With Hot-Mix Surface

## Western Arizona Airfield Strengthened for Heavier Wheel Loads by Additional Top on Undamaged Surface

By FRANK B. SARLES,  
Western Field Editor

(Photos on page 88)

† UNDER a program providing for increased load-bearing capacity, the runways at the Army Airfield at Yucca, Ariz., were improved during 1944 by the addition of a 2-inch plant-mix asphaltic-concrete surface. The contract for this work was awarded by the Los Angeles District, U. S. Engineers, to Tiffany Construction Co., Phoenix, Ariz., and the work was completed during the summer of 1944.

Since the original runways had proved adequate under the intensive training program conducted from them, it was felt that their bases had sufficient stability and that the additional 2-inch top would add enough strength to permit the operation of heavier planes. Additional parking aprons and warm-up pads of 13-11-13-inch portland-cement concrete were included in this contract and the taxiways were widened from 50 to 75 feet and surfaced with an additional 2 inches of hot-mix. For this work, 6 inches of the existing subgrade for the concrete paving was compacted to 95 per cent of Proctor density and a 6-inch flexible base of gravel was constructed to a like density for the taxiway widening.

In addition to the usual field tests for density, the entire area to be covered by new aprons, warm-up pads, and widened taxiways was tested by a LeTourneau RU-17 scraper filled to a weighed load of 35,000 pounds on each of the two rear wheels, to show up any unstable subgrade or base course. This machine was pulled by an Austin-Western 99 motor grader while testing the foundation courses.

### Aggregate Production

Acceptable aggregates for the hot-mix were secured from the bed of a dry wash adjacent to the reservation. A Bucyrus-Erie 37-B shovel working a 10 or 12-foot face loaded the material, without preliminary blasting, to two trucks which hauled 4-cubic-yard loads about 2,000 feet to the crusher. The haul road was laid out in a circle, the loaded trucks driving over a ramp, dumping their loads onto a grizzly of rails on 8-inch centers, and returning around the circle to the shovel, thus eliminating the delay incident to backing.

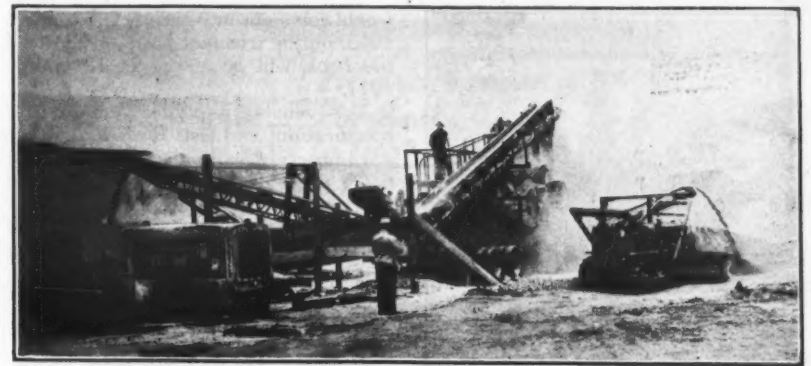
At the grizzly two men dumped the trucks and disposed of the oversize material. A 24-inch conveyor belt under the grizzly fed the Pioneer 38V Duplex crushing and screening plant which had a 10 x 36 primary crusher, 18 x 30-inch rolls, and a 3 x 10-foot vibratory screen with 1 1/4-inch maximum openings, and was powered by a Caterpillar D13000 engine. Approximately 10 per cent of

the minus No. 4 material was rejected by the screen and discharged on the left side of the plant where a Caterpillar D6 tractor with a LeTourneau bulldozer pushed it out of the way.

A second Pioneer belt conveyor transported the product of the crushing plant, which averaged 700 cubic yards per 9-hour day, to a stockpile from which it was pushed by a LeTourneau bulldozer on a Caterpillar D8 up a ramp of the aggregate into a 20-ton steel bin for feeding the drier.

### The Hot-Mix Plant

Fed by gravity from the bin, the material dropped onto a 24-inch Pioneer belt conveyor feeding a Standard Steel Works drier. No dust collector was used, and the dried aggregate was delivered



U. S. Engineers Photo

A Pioneer Duplex crushing and screening plant produced the aggregate for the hot-mix paving at the Yucca Army Airfield, averaging 700 cubic yards per 9-hour day.

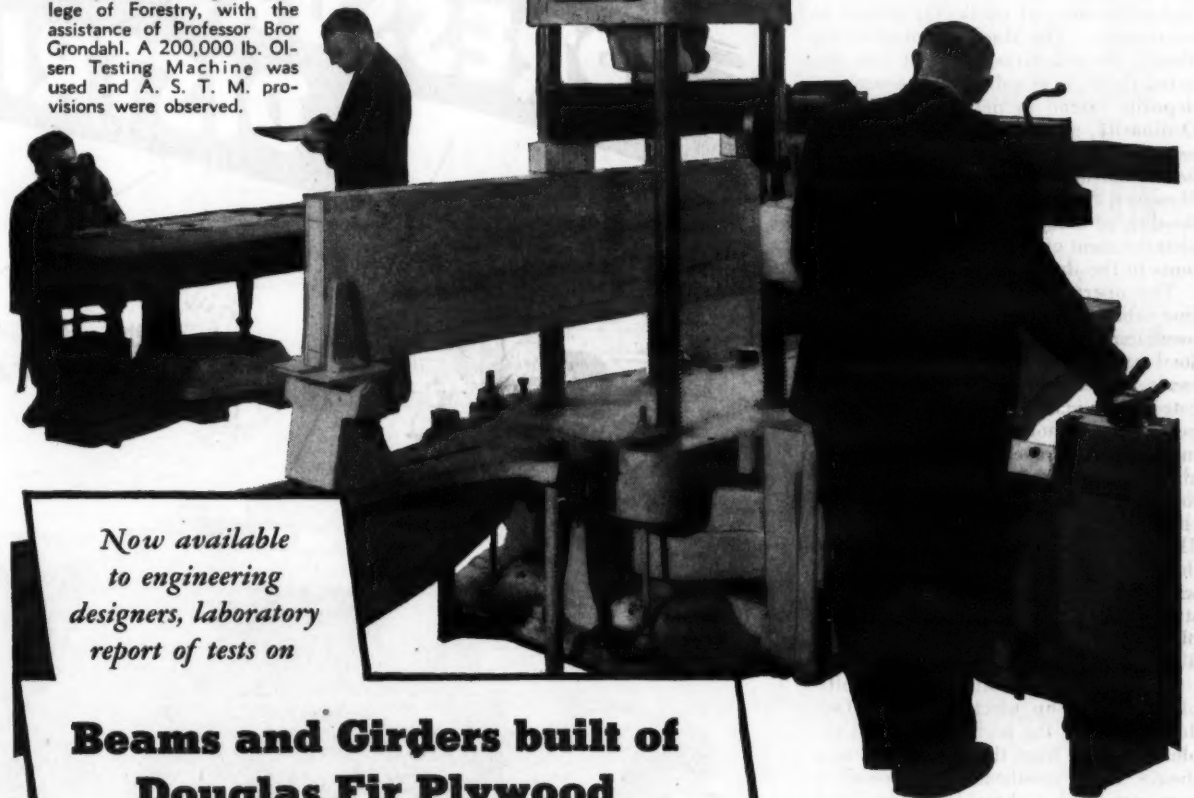
by the hot elevator to a 3 x 10-foot Symons vibratory screen with 1 1/4 and 1/4-inch sections which separated the aggregate into plus and minus No. 4 sizes for delivery to the two hot bins of the Standard Steel Works asphalt plant.

Asphalt of 120 to 150 penetration was shipped by rail from the Los Angeles

plant of the Petrol Corp. to the airfield, heated by a 35-hp marine boiler, and hauled about 2 miles to the hot-mix plant located close to the aggregate pit. Transferred from the booster truck to a 6,000-gallon storage tank at the plant by a pump mounted on a Ford Model A

(Concluded on page 79)

The plywood beams were tested in the Materials Testing Laboratory of the University of Washington College of Forestry, with the assistance of Professor Bror Grondahl. A 200,000 lb. Olsen Testing Machine was used and A. S. T. M. provisions were observed.



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## Beams and Girders built of Douglas Fir Plywood

The recent use of I-beams, girders and box-beams with plywood webs for numerous industrial buildings has aroused considerable interest among the nation's engineering designers. Previous reports,\* published by the Douglas Fir Plywood Association laboratory, have covered the results of exploratory tests on relatively small beams.

The latest laboratory report details the fabrication and testing of 13 full-scale plywood beams 25 feet in length and from 18 to 36 inches in depth. An outline of fabrication methods, a discussion of fabricating techniques and an analysis of material and labor costs are covered in Part One of the report.

Part Two discusses the test methods, strain gauge results, test results, observation and conclusions. In general, the conclusion justified by the results of these

and previous tests is that built-up plywood beams can be accurately designed by using recognized engineering formulas and methods, and that such members will perform according to the elastic theory.

The full report is of interest to engineering designers concerned with the utilization of plywood as a structural material. A copy of the report is available upon

request to N. S. Perkins, Technical Director, Douglas Fir Plywood Association, Tacoma 2, Washington.

\*No. 27, "Fundamental Shear Stress Values and Exploratory Tests of Small Built-up Beams."

No. 28, "Stress Distribution and Ultimate Load Tests on Eight-Foot Plywood Girders."

No. 29, "Load Tests on Additional Eight-Foot Plywood Girders."

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The 8-yard slackline-cableway bucket leaving the water with its load of gravel.

### Slackline Cableway Licks Ground Water

An interesting excavation problem in gravel deposits where usually no ground-water troubles are met was recently recorded in *The Crosby Clipper*. The method of overcoming the unexpected appearance of ground water makes the story of particular interest to contractors. The Monrovia plant of the Pacific Rock & Gravel Co. of Los Angeles, Calif., is in a district where gravel deposits extend to depths of 400 feet. Ordinarily, ground-water trouble is not encountered before the deposits have been excavated to a depth of 125 feet. However, in the instance described, flooding at a depth of 60 feet forced the abandonment of shovel and truck operations in the dry.

The operators converted to a slackline cableway system which immediately overcame the problems. A 1,000-foot steel cable  $1\frac{1}{2}$  inches in diameter extends from the top of a 120-foot fabricated steel mast to one of a series of permanent anchors spaced 300 feet apart in the coarse gravel of the high ground above and back of the pit face opposite the mast. The end is moved from anchor to anchor as material is excavated. The mast is supported by six guy lines, three single strands of  $1\frac{3}{8}$ -inch steel wire on the pit side, and three double strands of  $1\frac{3}{4}$ -inch steel wire on the plant side to take up the heavy strain of digging and hauling.

The high line is controlled by a multiple-drum 300-hp electric hoist. One drum operates the high-line control cable that leads from the hoist direct to a sheave in the masthead and, through a four-part block and tackle, tightens and slackens the high line. A  $1\frac{1}{2}$ -inch drag line leads from its drum to a block in the base of the mast, thence upwards inside and out over the topside sheave to the 8-yard bucket. Wire rope fastened with Crosby clips slings the bucket to the four-wheel carriage that rides the high line.

In operation, the bucket is run out by gravity on a taut high line with the drag line controlling the speed. When the digging position is reached, the bucket is checked, the high line slackened, and the drag line tightened. The sag of the high line lowers the bucket into the water at the far side of the pit and, with strain started on the drag line, the shovel begins to load up. On leaving the water at the near side, the bucket climbs the slope to the stockpile top and dumps. The high line tightens, the drag line slackens, and the empty bucket races back for another load.

### ASTM Standards Book Advanced One Year

The heavy demands for the 1942 Book of Standards of the American Society for Testing Materials, occasioned by war production efforts, have necessitated advancing by a full year publication of the next book of standards. Normally this

would come out in November-December, 1945, on the triennial basis, but instead the book will be issued in December, 1944.

This volume, providing authoritative specifications and tests for a wide range of engineering materials, will cover some 6,000 pages in three parts: 1. Metals; 2. Non-metallic Materials—Constructional (cement, lime, concrete, paint, etc.); 3. Non-metallic Materials—General (petroleum, textiles, plastics, coal, rubber, etc.)

### Virginia Issues Bridge Map

The Virginia Department of Highways will soon issue the first bridge-capacity and overhead-clearance map for use by carriers of commodities requiring special equipment. It is expected that this map will enable all operators of motorized equipment to route traffic over roads which will allow the passage of legal-size and weight equipment over bridges and under overhead crossings with the least trouble and delay.

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## Rye Pier's Repairs Exceed First Cost

In Fifteen Years, Untreated Material in Playland Pier Was Replaced by Creosoted Piles, Braces, Caps and Stringers, With Treated Decking

AN unexpected influx of marine borers into waters previously considered free from them, combined with decay, raised havoc with untreated timbers and piles in a pier located on Long Island Sound at Rye, N. Y. The structure was built fifteen years ago as a temporary steamboat pier at Playland, Westchester County's foremost amusement park. Damage from marine borers was not anticipated at that time, since other untreated timber-pile installations in surrounding waters had been in service for some years with no sign of attack. However, in these fifteen years it has been necessary to repair the temporary structure by five separate maintenance projects, until at the present time practically all under-deck material, about 75 per cent of the piles, and 57 per cent of the deck have been replaced by treated timber. The cost of the original installation was \$45,734, and the five maintenance contracts carried out to this time total \$54,522, or 119 per cent of the original cost.

Replacements began in 1931 when 75 of the original 495 piles and many bracing timbers showed serious marine-borer attack and were replaced by creosoted material. Further replacements of unserviceable piles and bracing were made in 1936 and 1938 and by the end of 1938, 476 of the original untreated piles and practically 100 per cent of the under-deck braces had been replaced by creosoted timber.

During a heavy storm in the autumn of 1943, waves washed between the ends of the two protective stone breakwaters and struck the pier with such force that much of the untreated decking was torn off, the caps and stringers having decayed so badly that the holding power of the spikes was lost. A survey of the damage immediately after the storm showed extensive decay in these members, many of the caps having been patched previously by nailing scabs on them.

Repairs were made early in 1944. All stringers in the main pier and a number of the caps were renewed with creosoted timber. In this repair work, which was completed early in 1944, 21 new piles, 20,000 board feet of S2E interior stringers, and 21,000 board feet of timbers of large dimension were installed, all pressure-treated with creosote. Approximately 57 per cent of the main pier decking was replaced with 21,000 board feet of Wolmanized lumber.

Plans, specifications and contracts for the 1944 reconstruction work were carried out under the direction of James C. Harding, Commissioner; Chester A. Garfield, Principal Assistant Engineer; and John Weyant, Design Engineer, all of the Department of Public Works, Westchester County, White Plains, N. Y. The contractor on this work was Lewis & McDowell, Inc., of New York City.

This material was prepared from a longer illustrated article appearing in *Wood Preserving News* for August, 1944.

### Caterpillar Appointments

The advancement of W. K. Cox to the position of Assistant General Sales Manager has been announced by the Caterpillar Tractor Co., Peoria, Ill. Since joining the company in 1928, Mr. Cox has been engaged successively in logging, industrial and general sales work and, following a year's assignment in the Advertising Department, he was named Assistant Manager of the Sales Develop-

ment Division in 1937. He became Assistant Sales Manager of the Eastern Division in 1941 and Manager in 1943. During the early part of the war, Mr. Cox also served as Manager of the Expediting Division for speeding up the delivery of purchased raw material.

William S. Ziegler has been appointed Sales Manager of the Caterpillar Eastern Sales Division. He will be succeeded as Assistant Sales Manager by F. D. Haberkorn, formerly the company's representative in Texas and Oklahoma.

### Rotary Plow Bulletins

Several new folders recently published by the Rotary Snow Plow Co., 1611 Central Ave., Minneapolis, Minn., describe in detail the exclusive features of the Snow King rotary snow plow for mounting on trucks or tractors. The leaflets have a number of illustrations of these snow plows in action.

To obtain copies of these folders just write to the company and mention this item.



**In drawing your Plans for Safer Highways be sure to include the Guard Rail - that Safeguards**

Even as a post-war product, TUTHILL Guard is now thoroughly modernized — for its advanced design assures what every Highway Engineer wants: Impact-absorbing qualities, high visibility, durability and attractiveness. (Available now for maintenance and repairs.) Request details.

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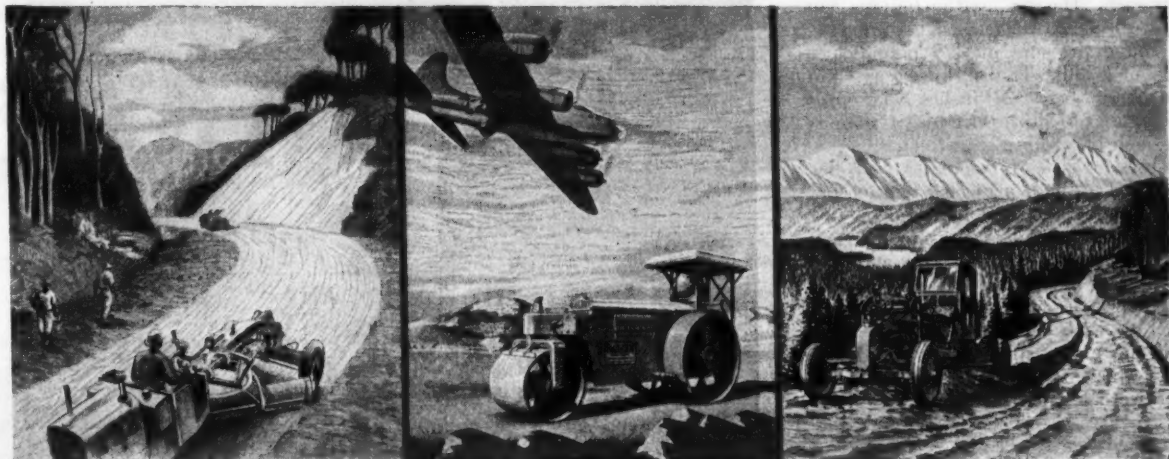


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# GALION

## FOR PROGRESSIVE ROAD CONSTRUCTION

In the March to Victory—In Post-War Planning



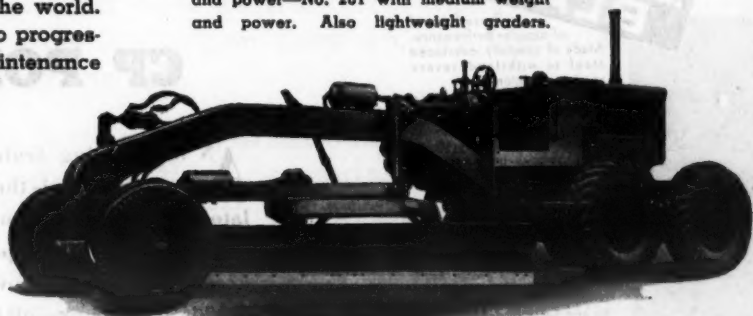
Galion continues to serve with essential road rollers and motor graders in all branches of the service.



Galion road machinery contributes to the all-out effort by serving with our armed forces in all parts of the world. Galion expects to contribute to progressive road construction and maintenance

in the post-war period just ahead. Since 1907, Galion machines have provided top performance on thousands of jobs where speed, power, maneuverability and efficient operation are paramount. Remember Galion in your post-war planning.

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Tandem  
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## Roller Types Used On Compaction Tests

(Continued from page 8)

each other. The drums were connected by a frame in such a manner as to permit the rollers to adapt themselves to uneven ground.

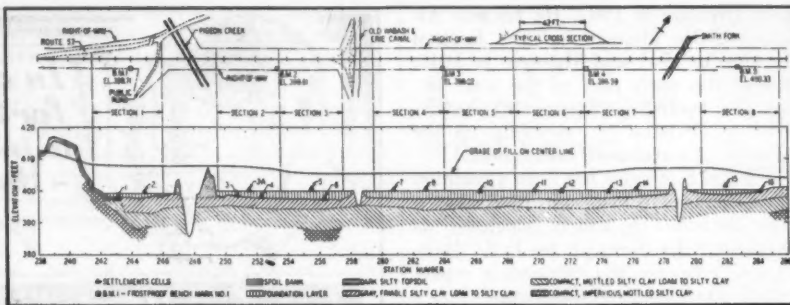
### Details of Sheepfoot Rollers

	Indiana, Type A	Ohio, Type A	Ohio and Indiana, Type B
Number of drums	2	2	2
Diameter of drums (inches)	40	40	44
Length of drums (inches)	48	48	48
Distance between drums (inches)	10	10	8
Total width of tamped area (inches)	106	106	104
Number of feet per drum	88	88	112
Number of feet on ground	8	8	8
Length of feet (inches)	7	7	7
Tamping area of each foot (square inches)	5.5	5.5	5.25
Weight, drums empty (pounds)	5,100	6,250	7,350
Weight, loaded with water (pounds)	9,200	9,800	12,200
Ground pressure, drums empty (pounds per square inch)	116	142	175
Ground pressure, loaded with water (pounds per square inch)	209	223	290

Twenty-two rows of tamping feet studded each drum on the Type A rollers. Each row had four tamping feet so located that they were staggered with respect to the feet in the adjacent rows. Each tamping foot had an enlarged elliptical contact surface of  $5\frac{1}{2}$  square inches. Type B had 28 rows of tamping feet. Each foot had a rectangular cross section with the longer dimension increasing with the distance from the drum and the shorter dimension uniformly  $1\frac{1}{2}$  inches throughout its entire length. The tamping feet were attached to a  $\frac{3}{8}$ -inch removable circumferential band and could be replaced with feet of different sizes.

The three-wheel rollers weighed 10 tons each. The one used in Indiana had rear wheels 23 inches wide, producing a ground pressure of 325 pounds per inch of width. The one used in Ohio had rear wheels 20 inches wide producing a ground pressure of 350 pounds per inch of width.

The same type of pneumatic-tire roller was used on both projects. It consisted of a loading platform mounted on two axles equipped with nine smooth truck tires, four on the front axle and five on the rear axle. The tires on the front and rear axles were staggered with respect to each other so that they covered the entire strip, 60 inches wide, over which the roller traveled. The tires were inflated to a pressure of 35



Plan, profiles and details of an experimental soil-compaction project in Indiana.

pounds per square inch. The roller had a net weight of 2,680 pounds, but the platform was loaded so that under working conditions the roller gave a pressure of about 225 pounds per inch of width of tire surface in contact with the ground.

### Soil Properties Vary Greatly

Prior to the construction of the embankments, subgrade surveys were made on both projects to determine the

character of the soil in both the fill and the borrow areas. In Indiana, the top 3 to 4 feet of the soil in the embankment area varies from a gray friable silty clay loam to silty clay. This is underlaid by a more compact, mottled material of the same texture. At depths of from 9 to 12 feet, it grades into a compact, impervious silty clay. Free water was found in many places on top of the compact layers of soil. According to the test data, the soils

have physical properties of the A-4 and A-7 groups.

The material used in the Indiana embankment was obtained from three sources in the upland areas adjacent to the fill locations. Soil profiles at the three sources were similar in character. The upper layer, about 12 inches thick, was a brown friable silt loam or silty clay loam having physical properties of the A-4 group. The underlying soils to depths of more than 14 feet varied from a mottled gray and brown to a grayish silty clay or clay, which was friable when dry, crumbly when moist, plastic when wet, and had physical characteristics similar to those of the A-4 and A-7 groups.

The existing road on the Ohio project was surfaced and, therefore, borings were made with soil augers along the shoulders and ditches. Four types of soils were found on the experimental section: 1, a brown silty clay or clay having physical properties of the A-4 group; 2, a brown dense plastic clay.

(Continued on next page)

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## Shunk Snow Plow and Ice Removal BLADES

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SHUNK SAW-TOOTH ICE BLADE. Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.



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## Building Indiana's Test Embankments

(Continued from preceding page)

having physical characteristics similar to those of the group A-7 soils; 3, a gray, dense silty clay, having physical properties of the A-4 group, which underlies the first type; and 4, a very heavy clay of the A-7 group, found in making the borings but not used in any of the embankments owing to its occurrence below the depth of excavation.

The soil in a borrow pit tested was similar to the material found in the roadway cuts. Medium-sized boulders were found in all the soils.

### Moisture Densities Determined

In Indiana the maximum densities and optimum moisture contents of representative samples of the materials used in the embankment were determined by a compaction test similar to that described under Method T 99-38 of the American Association of State Highway Officials. It differed from the standard method in that a separate portion of the sample was used for each change in moisture content.

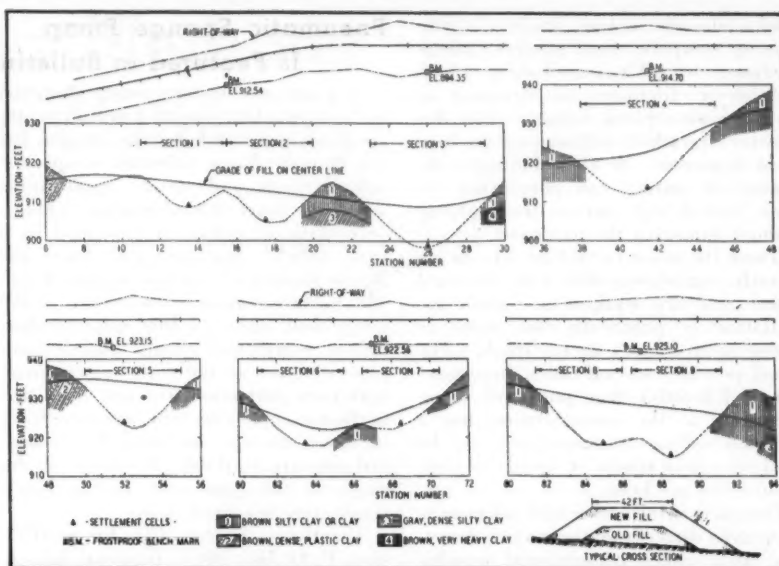
Tests were performed in a field laboratory located at Buckskin. Results of these tests were plotted and used to control the compaction of all sections and the moisture content of the soil in section 1 during the construction of the fill.

In Ohio the compaction tests were performed in the laboratory at Columbus and were in strict accordance with the standard method, AASHTO designation T 99-38.

### Construction of Indiana Project

The clearing of the embankment area in Indiana was completed during the first week of July, 1938. Construction of the fill was delayed until July 26 by heavy rains which flooded the low bottom lands with as much as 3 feet of water. After the water receded, the soil in the low area was so wet and soft that it would not support the construction equipment. As the soil dried very slowly, a foundation layer was placed to facilitate the operation of the equipment used. This was done by end-dumping from trucks, spreading the material with a bulldozer, and compacting with a sheepfoot roller. The layer was placed in lifts having a maximum loose thickness of about 10 inches. Considerable difficulty was encountered in operating the equipment on the first lift of the foundation layer due to the surface irregularities produced by the subsidence and displacement of the soft undersoil. The sheepfoot roller was very useful at this stage of the work since it would adapt itself to the uneven surface and could be backed out on soft soil which would not support the tractor. However, it was necessary to vary the amount of water in the drums to adjust the weight of the roller to fit the soft undersoil conditions.

Most of the foundation layer on sections 2 and 3 was placed with trucks having a capacity of 8 cubic yards. These were replaced by trucks holding



Plan, profiles and details of the experimental soil-compaction project in Ohio.

1½ cubic yards which were found to be more satisfactory for the conditions ex-

isting on this job.

The fill material for section 1 in Indiana was placed in lifts 6 inches thick, loose measurement, by dirt-moving scrapers having a capacity of about 8 cubic yards. The first two lifts were not uniform in thickness and compaction, owing to the unevenness of the ground surface and the tendency of the fill material to be displaced as a result of the spongy character of the undersoil.

Following the placing of the first lift over the full width of the embankment area, each succeeding lift was constructed in two parts, each part being one-half the width of the fill section. One-half of the lift was compacted while material was placed on the adjoining half. This method was adopted in order to avoid compacting the spread material by any means other than by the roller specified for the section.

Prior to compaction, the soil on each half lift was tested to determine if its moisture content was within the toler-

(Continued on page 42)



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The Henneuse Flat Wheel may be changed with conventional wheels and tires to provide greater traction for trucks, graders, and other construction equipment.

### Metal Crawler Wheel For Trucks, Tractors

A so-called "Flat Wheel" which fits into the gap between the conventional crawler track and the pneumatic tire has been developed by Henneuse Engineering Co., Marion, Ohio, for use on motor trucks, wheel tractors, fork lift

trucks, shovels, cranes, trailers, earth-moving scrapers, road graders, wheelbarrows, etc. When used on a wheelbarrow, it eliminates the necessity of laying down a plank runway, since this crawler-type wheel will support the load on soft ground. It also eliminates the danger of cutting and puncturing the tires, and it will run on the highway without damaging the pavement.

These Henneuse metal Flat Wheels are directly interchangeable with standard wheel and tire equipment. Their installation is practically the same as changing tires on a motor truck. The wheel provides several times more traction and flotation than pneumatic tires, according to the manufacturer, has a very low rolling resistance, and can be used on motor trucks at speeds as high as 40 miles per hour.

Complete information and prices may be secured direct from the manufacturer, who also makes conventional crawler half tracks of both steel and rubber tread, by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

### Pneumatic Sponge Pump Is Featured in Bulletin

A pneumatic sponge pump designed for pumping heads up to 150 feet, in single stage, and 300 feet in two stages, for use in cofferdams, caissons, sumps, for salvage work and similar applications where the pumped fluid contains a heavy percentage of solids, is described in a new bulletin just received from the Byron Jackson Co., of Los Angeles, Calif. The bulletin contains illustrations of the component parts of this rotary-motor-driven centrifugal pump, and a complete diagram of the entire mechanism, with each part numbered and identified in the accompanying table of parts. Specifications are also included. Two standard sizes are available: 2½ inches in the single or two-stage units and a 3-inch single-stage low-head unit.

The Byron Jackson Co., Pump Division, P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif., will be glad to forward copies of this Bulletin No. 44-7035 upon written request.

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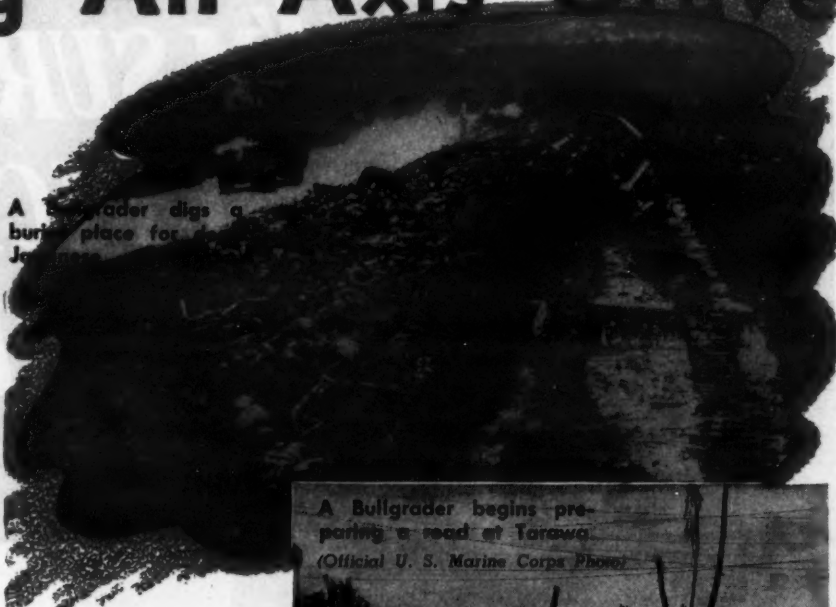
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## Digging An Axis Grave

An American Bullgrader digging, literally, an Axis grave is symbolic of the jobs dirt-moving equipment has done to speed complete Victory. On every front, the work of bulldozers, Dozershovels, scrapers, etc., hastens the final funeral of the frenzied fanatics.

On every front, too, Bucyrus-Erie tractor equipment like the Bullgrader above is in the thick of it. Outstanding as always, now it is helping prepare the Axis burial.



A Bullgrader digs a burial place for the Axis.

A Bullgrader begins preparing a road at Tarawa. (Official U. S. Marine Corps Photo)

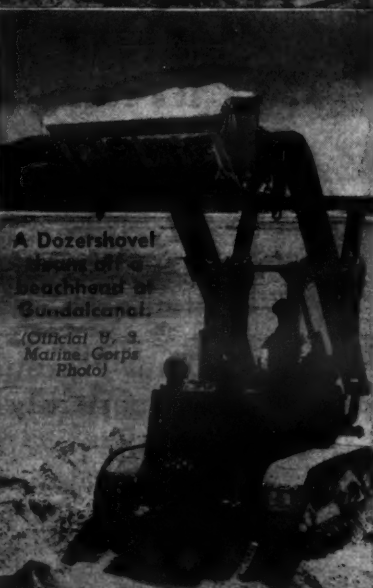


Most of our production must still go to our armed forces; a limited number of machines is, however, now available for high priority civilian operations. Be sure to see your International Tractor Distributor for information on new machines, rentals, and service.

BUCYRUS-ERIE CO., SOUTH MILWAUKEE, WISCONSIN



A Bullgrader with dual wheel scraper dual unit maintains a road on a S. W. Pacific Isle. (Official Navy Photo)



A Dozer shovel clears a beachhead at Guadalcanal. (Official U. S. Marine Corps Photo)

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# Mud-Pumping Methods And Costs in California

## Experiments in District V Develop Reduced Costs and Improvements in Material And Operating Methods

(Photo on page 88)

AN extensive mud-pumping program during the past two years in District V of the California Division of Highways, with headquarters at San Luis Obispo, has been directed toward checking the progressive cracking of portland-cement concrete pavement caused by pumping action at the joints, and cracks following the repeated passage of heavy wheel loads. H. L. Cooper, Maintenance Engineer of District V, describes the experimental work and developments in a recent issue of *California Highways and Public Works*, published by the Department, from which this material is abstracted.

### Initial Work

Some mud-pumping was done during the 1943 season and the experience gained that year was of great value in planning the work for 1944. Work orders in the total amount of \$14,100 were authorized on twelve sections at various locations from the Santa Clara County line to the Ventura County line on U. S. 101, where the step-offs, or progressive cracking, were noticeable, particular attention being paid to those sections where light bituminous blankets were to be placed during the summer, either by contract or by day labor.

### Equipment Used

Work was started February 1, 1944, at the north end of District V with drilling and mud-pumping crews. The drilling-crew equipment consisted of a 370-cubic-foot Ingersoll-Rand air compressor, one 3-cubic-yard Chevrolet dump truck, two 60-pound hammers, and one Ford pickup truck. The mud-pumping equipment consisted of a Chevrolet utility paint truck with an air compressor, one 3-cubic-yard dump truck for hauling mud, one 6-ton trailer, one 1-sack concrete mixer, one 7-cubic-foot mud container, and one Chevrolet express truck.

### Material Used

The material used at the beginning of the work was selected roadside material with the following screen analysis:

Screen	Per Cent Passing
16	100
30	99
50	76
100	14
200	6
270	5

This material was mixed to give a moisture equivalent of 19.6 per cent and had a linear shrinkage of 0.8 per cent. The combined mud mixture consisted of 1 cubic yard of sand, 5 sacks of cement, 100 pounds of diatomaceous earth, and 56 gallons of water, giving a combined weight of about 3,440 pounds. A total of 1,100 holes was filled with this material, but after the work progressed farther south, it was found

that a sand material which gave better results in the combined mix could be purchased from a commercial plant at \$1.20 per cubic yard. This material had the following screen analysis:

Screen	Per Cent Passing
8	100
16	94
50	76
200	14-20

The combined mud mixture with this new sand material consisted of 1 cubic yard of sand, 5 sacks of cement, 32 to 64 pounds of diatomaceous earth, 92 to 116 gallons of water, and 50 to 100 pounds of plaster-of-Paris, giving a combined weight of about 3,500 pounds.

### Time Saved

There was considerable experimenting

with this material to obtain a workable mix that would flow freely into the voids and have an initial set soon enough so that traffic passing over the freshly filled areas would not force the mix out from under the pavement. The addition of the plaster-of-Paris set up the mix in 15 to 35 minutes, while before its addition several hours to as much as a day were required before a set was obtained.

It was found that in areas with small voids better results were obtained by increasing the diatomaceous earth content to 64 pounds per cubic yard and decreasing the plaster-of-Paris to 50 pounds which also increased the water content necessary to 116 gallons per cubic yard.

When large voids were encountered, 32 pounds of diatomaceous earth and 100 pounds of plaster-of-Paris were used. This allowed traffic to move over these distressed areas in a very short time without any visible effect on the mud content.

After moving to Santa Barbara County in the southern part of the District,



California Division of Highways Photo  
Drilling holes adjacent to a joint preparatory to mud-pumping.

the cost of trucking the entire amount of the sand required from the commercial plant at Atascadero was so high that a commercial sand in Santa Barbara was mixed with the Atascadero sand on a 33½ to 50 per cent basis which gave satisfactory results.

(Concluded on page 55)

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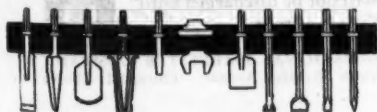
The folder illustrated at the right tells briefly of Cletrac's part in the war effort. A copy will be mailed on request.

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## Admixtures Used For Ohio Paving

**Concrete Paving Project  
In Toledo Includes Sand  
Blanket Course and Test  
Sections for Scaling Study**

By J. L. TYGART

† THE original pavement on Fearing Street in Toledo, Ohio, was a 3-inch brick wearing surface with a 1-inch sand cushion on a 6-inch plain-concrete base. This street carries the heavy traffic on U. S. Route 25 and Ohio Route 2 around the business section of the city. Due to bad subgrade conditions and base and wearing-surface failures, it was necessary to replace this pavement with one of modern design. Lying largely in cut, Fearing Street passes under eight separate overhead railroad crossings carrying a total of about thirty tracks. Because of this, only slight changes in the original grade were possible.

Features of the project, the contract for which was awarded to Launder & Son, Toledo, by the Ohio Department of Highways, included a blanket course of classified embankment material to stabilize the subgrade, and the use of two types of concrete mixes in order to study the effect of chlorides for ice removal on air-entrained concrete pavement.

### The Mixes Used

The low points in the profile of this road lie under each of two clusters of overhead bridges and are collection points for considerable surface water and subsequent ice in the winter months. Anticipating the use of chlorides for ice removal in these sections, with possible scaling of the concrete, it was decided to place specially designed concretes on the entire project in order to test and study the value of two kinds of air-entraining agents in the concrete pavement and the effects of chlorides on these concrete mixes.

The cement specification called for Emergency Alternate Specification for Portland Cement ASTM Designation EA-C150. The Ohio Department of Highway's Class D-1 concrete, with a minimum cement content of 6.5 bags per cu-

bic yard of concrete and a slump range of 2 to 3 inches, was used.

Concrete for the two strips forming the south half of the road in the test section was mixed with Master Builders HP-7 air-entraining cement-dispersing agent as an admixture. The specifications required that sufficient HP-7 be added to the concrete mix to cause a 3 to 5-pound reduction in unit weight per cubic foot of concrete as compared with concrete made without adding HP-7. On this project, 1 pound of HP-7 per bag of cement was added, resulting in a 3½-pound reduction in the unit weight.

Concrete for the two north strips has a different mix, with a Vinsol-resin-sodium-hydroxide-water solution added at the paver. The specification for the reduction in unit weight was the same as that for the HP-7, that is, 3 to 5 pounds per cubic foot of concrete as compared with concrete without any admixture. The addition of 0.010 per cent of Vinsol resin by weight of cement caused a 3½-pound reduction in the unit weight.

### Blanket Course

Inasmuch as a blanket course of classified embankment material had already proved its worth in stabilizing subgrade on another location in Division 2, according to E. L. Reeb, Division Engineer, it was also used on this project. It consists of a compacted layer placed on the prepared subgrade, varying in thickness from 9 to 24 inches, with the maximum thickness in the cut sections. Thus a dry stable base is provided, and subsidence will be minimized.

The specifications for this blanket course allow considerable variation in materials used. It may be bank gravel, slag, or may be produced by crushing stone, vitrified material, old concrete or other old pavement. Several grades, with varying screen analyses, have been designed. On this project, the contractor chose to use a material having the following average grading: 100 per cent passing a No. 8 sieve; 9.2 per cent passing a No. 100 sieve; and 2.4 per cent passing a No. 200 sieve.

The blanket course was compacted by

pneumatic-tire rollers in layers not exceeding 9-inch compacted depth, and the final rolling done by a 3-wheel 10-ton gas-engine-driven Galion roller.

### Construction Operations

In removing the original paving materials, the stone curb was taken out by hand so that as much as possible of it could be reclaimed by redressing. About 50 per cent of the curb stone was salvaged for re-use on the project. The new curb is stone also.

After removal of the stone curb, half of the road width was excavated for the full depth by a Lima ¾-yard shovel. The contractor used the remaining half for the movement of his equipment, especially the batch trucks. Since the clearance under the eight overhead crossings average only 15 feet, the shovel could not operate there, so a Caterpillar D7 with a LeTourneau Angledozer was used to move the material out from under the bridges to within reach of the shovel.

(Concluded on page 59)



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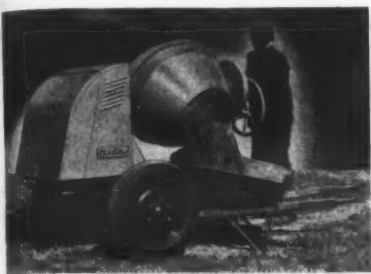
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The new Kwik-Mix 3 1/2-S side-discharge concrete mixer.

### A Light-Weight Mixer On Trailer Mounting

For small concrete construction jobs and for highway maintenance forces, the Kwik-Mix 3 1/2-S side-discharge light-weight trailer-mounted concrete mixer has many uses. It is simple in design, sturdily constructed, and compactly assembled. This tilting mixer is easily moved from job to job behind a truck or automobile as it is full-spring-mounted and has pneumatic tires and a sturdy axle which permits high-speed trailing.

It discharges at a height of 27 inches, and the batch may be quickly delivered into wheelbarrows, conveniently spotted below the tilted drum which is easily moved by a lever-control tilting mechanism. A quick-action friction brake holds the drum in position, and for easy and complete cleaning it is possible to tilt the drum to an upside-down position. The overall weight of the 3 1/2-cubic-foot mixer is 1,000 pounds, and it is powered by a Fairbanks-Morse Model Z engine of 2 hp which drives the mixer drum through a V-belt.

Complete information and illustrations of this mixer in service will be found in Bulletin KM 186 which will be sent promptly to those writing direct to the Kwik-Mix Concrete Mixer Co., Port Washington, Wis., and mentioning this item.

### A New Army School For Steel Workers

At the Army Service Forces Training Center, Camp Claiborne, La., a new training unit called a Structural Steel Workers School has been organized. Its purpose is to provide field training operations on the erection and reinforcement of steel structures. It is a specialized organization designed to train selected members of Engineer units to build, reconstruct, and reinforce steel bridges, steel hangars, or other steel structures used by tactical military units.

The training given at the school will be divided into two phases: first, classroom work in which the theory of erecting structural steel will be taught, and, secondly, field instruction which will afford the students an opportunity to put their knowledge to practical application by building and reinforcing steel structures on the training grounds.

The assembling and emplacing of a 90-foot 56,900-pound steel-truss bridge is one of the field problems included in the 7-week course. The problem will include construction of abutments and supports, and the launching of the trusses. Another field problem is the fabrication of a large steel building on the training grounds. While the work will proceed under the supervision of instructors, the students will be left largely to their own skill and knowledge.

The student soldiers are men taken from General Service regiments and, upon completion of the 280-hour course, they will return to their units to perform the jobs they have been specially trained to do.

Captain R. L. Hubach is head of the school, serving as its Chief of Section. His assistant, Captain M. F. Barnett, will supervise all instruction in structural-steel layout and erection. Working directly under Captain Barnett will be an instructor in the hoisting and rigging

reinforcement. Other members of the school's staff will include an instructor in shop fabrication, a process involving the teaching of blueprint reading and marking of steel sections for cutting, an instructor in cutting and welding, and a riveting instructor.

### A New Brake Block For Extra Service

A heavy-duty brake lining which was developed for the Army Air Forces and which is expected to have a large post-war market in heavy-duty equipment will probably be available shortly for civilian use, according to the Raybestos Division of Raybestos-Manhattan, Inc., Bridgeport, Conn. This 1942 brake block is manufactured by a unique patented process which results in an unusual structure with a very high density, exceptional wear, temperature resistance, and stability, it is stated.

Tests of the 1942 brake block have already been made on trucks, busses, and

industrial equipment. It is being produced at the rate of 15 tons per day and will be engineered to the customer's post-war friction requirements on request.

Complete information regarding this new Raybestos heavy-duty brake block may be secured direct from the manufacturer by mentioning this news item.

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# Steel and Concrete Bridge Under Way at Charlemont

(Continued from page 2)  
hailed ashore.

## Temporary Foot Bridge

Members and the valuable timber was a temporary foot bridge, 300 feet long and 5 feet wide with a capacity of 100 pounds per square foot, was made from the lumber of the old bridge. First the old wooden pins, iron spikes and nails had to be removed with specially made claw and pinch bars. Then the old stock was ripped up and sawed into suitable sections by a C. H. & E. power saw driven by a Wisconsin air-cooled 4-cylinder gas motor. The bulk of this cutting was done with a Simonds inserted-tooth 14-inch-diameter blade, although other blades 6 to 20 inches in diameter were also employed.

Four cribs, each 5 feet wide, 12 feet long and 5 feet deep, filled with hand stone acted as piers. For stringers the upper chord of the old truss was placed in 75-foot lengths on top of the cribs. Two of these chords, each consisting of two 3 x 12's pinned together, were used, one on each side. On top of the stringers ran 4 x 4's, spaced at 4-foot intervals, which supported a decking made from 3 x 10's averaging 12 feet in length. A guard rail of 2 x 4's was the final touch.

## Start of New Bridge

The old stone piers and abutments were removed by a 3/4-yard clamshell and the material kept for riprap around the new abutments. Digging the substructure foundations was not easy. Borings showed about 5 feet of sand and gravel, underneath which lay rock and large boulders 2 to 4 cubic yards in size. Excavation proceeded by drilling and blasting, using jackhammers with Timken bits, powered by a Sullivan 110-foot air compressor. The Byers crane with an Owen heavy-duty 5/8-yard clamshell bucket dug the footings.

Foundations for two of the three piers were constructed within cofferdams of steel sheet piling. Sheet piling in 16 and 18-foot lengths was made available to the contractor from the Middleborough yard of the State Department of Public Works. Piles were driven by a McKiernan-Terry No. 7 hammer powered by a Scannell 65-hp steam boiler, with a drum length of 9 feet 5 inches and 4 feet in diameter. Water for the boiler and for the concrete mixer came from an adjacent 2-inch pipe line of the B. & M. Railroad through an agreement between the contractor and the railroad.

The steel sheet piling for piers 2 and 3 was driven to refusal or full length, and the piling itself was used as a form for the concrete pour. In building pier 2, the center pier, 11 feet of water was encountered, and one 6-inch LeRoi-powered pump, two 4-inch Hercules-powered pumps, and one 2-inch pump were needed to keep the water down so that concrete could be placed. The footing for pier 2 was poured under water but all other concrete was placed in the dry. Class B non-reinforced concrete with a 1:2.2:4.1 mix was used in the substructure; in the underwater pours, 10 per cent more cement was added. Gravel was used for the coarse aggregate.

An interesting phenomenon to the bridge builders was the rate of flow of the Deerfield River. Until 11:30 a.m. the river is a placid slow-moving stream. Then in half an hour the river rises 2 feet, and rushes along in a torrent, white-capping the rocks and boulders until nightfall, when it again subsides into lethargy. This is explained by the river control exercised by the New England Power Co. which releases water from the Whitingham Reservoir in Vermont.

A 2-bag Koehring Dandie mixer was set up over the old south abutment. A

3/4-yard concrete bottom-dump bucket was swung from the mixer to the pier by the boom of the versatile Byers crane. No seal coats were required with the rock sub-base. Footings for piers 2 and 3 are 29 feet 3 inches long, 9 feet wide and 4 feet deep. Pier 1, the north pier, is built on ledge rock above the water level, with wooden forms, and its depth varies with the slope of the ledge. After the foundations were completed, the sheeting was cut off at the river bed with a torch and left in place to furnish protection against scouring. Any space between the sheeting and the pier was filled with gravel.

## Abutments

The abutment forms were built of re-sawed lumber from the old bridge. The facing was 3/4 x 7-inch boards backed by

3 x 4's with 3 x 5 studs spaced 16 inches on centers. These were supported by double 4 x 4-inch wales, held in place by Richmond Tyscrus with 1/2-inch-diameter rods spaced 3 feet vertically and 2 feet 8 inches horizontally. The Tyscrus heads were kept 1 inch back from the surface of the concrete. The bracing was also of second-hand bridge lumber consisting of 3 x 7's, 3 x 8's and 3 x 9's of assorted lengths.

Abutment concrete was poured with wheelbarrows and chutes and vibrated by two White vibrators powered by Wisconsin motors. Sand, stone and bag cement were delivered to the project from neighboring towns. Gasoline for the motorized equipment was pumped from a 1,000-gallon subsurface tank supplied by the Gulf Oil Co., the contractor having made the necessary excavation for the tank.

The main walls of the abutments are 29 feet 6 inches long while the wing walls vary from 12 to 25 feet in length. Imbedded 3 feet 8 inches into the top of each pier and abutment, on the upstream

side, is a 16-inch wide-flange 40-pound section, 5 feet long. On the upstream side of these beams, a section of 12-inch channel is riveted to the bottom of the diaphragm, preventing any sideways movement from ice or high water. This is designed to prevent the shearing of the anchor bolts. Each girder is fastened to the piers and abutments by two 1-inch round bolts embedded 10 inches into the concrete.

## Piers Protected Against Ice

With all footings poured, the contractor next turned to the piers themselves. Again the lumber of the old covered bridge was used for forms. Piers 2 and 3 are built 25 and 20 feet respectively above their footings while pier 1, on higher ground, is only 10.5 feet high. The piers taper upward from the footings to a 3-foot width at the top. The upstream faces of the piers are beveled, and buttressed with steel nose angles imbedded in the concrete to withstand the shock of ice floes. These angles are

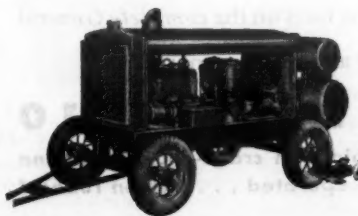
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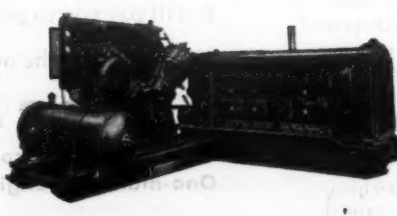
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## New Heating Torch With Multiple Tips

A new heating torch especially designed for concentrated localized heating, such as is required for bending, straightening and shrinking of steel plate, has been announced by the Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. This torch, Style 9802, is reported to be lighter in weight than heating torches of the past, yet it has equal gas capacity. Five new multi-flame acetylene heating tips as well as two multi-flame propane heating tips are available for this torch. These seven tips are designed to meet the requirements of every heavy heating job. Three mixers are also available for the torch, for positive pressure acetylene, low-pressure acetylene, and for propane. The available extensions include a 12-inch straight extension and 18, 24, and 42-inch angular extensions.

Complete information regarding this new Airco heating torch may be secured direct from the manufacturer.



The new Airco multi-flame heating torch.

### S. J. Groves Moves

Announcement has been made by the S. J. Groves & Sons Co., well known contracting firm, of the removal of its New Jersey headquarters to Woodbridge, N. J. This company, whose address was

erroneously given as Bogota, N. J., in an article describing its contract at the Newark, N. J., Airport in the September issue of CONTRACTORS AND ENGINEERS MONTHLY, was formerly located at Ridgefield, N. J. The company's New York office is located at 19 Rector Street, and the General Offices are located in the Wesley Temple Building, Minneapolis, Minn.

### New Roller Leaflet

A four-page illustrated bulletin describing one of the Three Bears, the three models of Pierce power road rollers, is now available. This Pierce Bear 3 1/2 to 5-ton medium tandem roller does not take the place of a heavy-duty roller, but is designed especially for maintenance and patching work.

Copies of this bulletin may be secured by interested state and county highway departments and by contractors direct from the H. W. Lewis Equipment Co., 431 Hoefgen Ave., San Antonio 3, Texas. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

## New Span Replaces Old Covered Bridge

(Continued from preceding page)

8 x 8 x 1-inch sections, 14, 18 and 22 feet long. They are bonded to the concrete by 1 1/2 x 3/8 x 12-inch Z sections, welded to the angles and spaced at 12 inches for the full length. The angles were delivered with one shop coat of paint; two coats of red lead and one green color coat were subsequently added. Pier faces are battered 1/2 inch to the foot.

### Structural Steel

The contract for the structural steel was let in a separate contract to the Bethlehem Steel Co. while plans were still being prepared for the substructure. This policy saved time and insured no delay in the arrival of the steel at the bridge site. The steel contract called for the furnishing and fabricating of 150 tons of rolled structural steel, delivered F. O. B. on railroad cars at the bridge site. The bridge contractor, Berke-Moore of Brookline, Mass., did the erecting.

The steel stringers consist of two 36-inch wide-flange (WF) 182-pound I-beams on the outside, and three 36-inch WF 150-pound I-beams within. These are spaced at 5 feet 4 1/2 inches. The beams are continuous for their 300-foot length, being spliced at a point 8 feet north of each pier. The superstructure is fixed on pier 2, at the center of the bridge, with expansion connections at piers 1 and 3, and expansion dams are provided at both abutments. Rivets are 7/8-inch with 15/16-inch round holes. Cross bracing is 21-inch WF 59-pound I-beams spaced 18 feet 9 inches. This structural steel supports a 6 1/2-inch Class A reinforced-concrete deck of 1:2.0:3.6 mix. The 24-foot roadway slopes from the center line 1/4 inch per foot to each side and surface water is drained off through 4-inch-diameter scuppers spaced 12 feet along the gutter. Steel posts and guard rail complete the superstructure.

### Major Quantities

Some material suitable for riprap was available from the old piers, which were removed to the stream bed. The sub-base of the approaches is gravel borrow with a base course of crushed stone bound with sand. On this will be laid a bituminous-macadam surface.

The major estimated quantities are:

Excavation	800 cu. yds.
Gravel borrow	900 cu. yds.
Steel sheeting	60,000 lbs.
Cement-concrete masonry, Class "A"	220 cu. yds.
Cement-concrete masonry, Class "B"	840 cu. yds.
Steel reinforcing for structures	54,000 lbs.
Structural steel erected	304,000 lbs.
Riprap	225 cu. yds.

Bid price on the delivery of the structural steel was \$13,406.40. The contract price for the bridge was \$39,200, making a total of \$52,606.40. Half of this cost is borne by the state, with the town and county contributing the other half.

Work was started in June on the new Charlemont bridge and it is expected to be open to traffic in December. The contractor employed an average of eighteen men. The maximum pour was 274 cubic yards of concrete for the south abutment which was done in six stages, using key joints.

### Personnel

The Depot Street Bridge at Charlemont was designed by the Bridge Department of the Massachusetts Department of Public Works under the direction of R. O. Spofford, Bridge Engineer. It is located in District 2 under the general supervision of Cyril Raymond, District Engineer. Raymond W. Coburn is Chief Engineer of the Department. The Resident Engineer is L. W. Brown, assisted by Timothy J. Scott. Joseph L. Gillis is Superintendent for Berke-Moore, the contractor. Selectman F. V. Wells is clerk of the Charlemont Town Board.

CONTRACTORS must do the impossible on today's construction jobs. Creating an airport in the dense jungle of some Pacific island or building a super-highway in Missouri — either one is a difficult job that must be done in record time. And because they are tough jobs, Sullivan contractor's equipment is chosen to help finish these, and countless other important projects on time.

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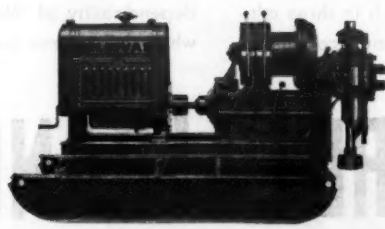
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# Wartime Practices For Roadside Care

**A Study of Methods Found Suitable by State Highway Departments to Conserve Men, Material, Equipment**

## Roadside Information

This article is abstracted from a report prepared by Frank H. Brant, Landscape Engineer, State Highway and Public Works Commission of North Carolina, for the Committee on Roadside Development of the Highway Research Board. The material was supplied by the landscape architects and engineers of the state highway departments and by George B. Gordon, Landscape Architect, Public Roads Administration.

(Photo on page 88)

AS the first sudden wave of wartime economy in the maintenance of roadsides subsided, and there was an opportunity for careful consideration of the effects of the economy practices, it was generally found that the elimination of some items of roadside maintenance resulted in increased cost of other general highway maintenance operations; some tended toward decreasing the safety of highway travel; some endangered crop production; and some reacted against the recreational needs of a public under the rush and strain of wartime work.

Although fully realizing the need for economy and for the conservation of labor, equipment, and materials under present wartime conditions, it is thought that the curtailment of most, or perhaps all, items of roadside maintenance is to be preferred rather than the complete elimination of some of the maintenance operations. The current problem is not one of maintaining the best roadside appearance; rather it is one of helping to keep highways safe and efficient, and to keep under control any effects that would cause a permanent loss of the investments already made in our roadsides.

## Erosion Control

Roadside erosion has an effect on all

other highway maintenance. Soil eroded from the slopes into roadside gutters must be removed or endanger the surfacing of the highway, particularly if it is a flexible type. Ruts or small washes in shoulders present a hazard to traffic and must not be neglected, any more than the pouring of pavement cracks.

In many states in the past, regular maintenance operations included a considerable amount of flattening and rounding of slopes, reconstruction and improvement of drainage structures, and seeding and sodding on old highways that had been constructed with narrow cross sections and steep slopes. Most of this extra betterment work has rightfully been discontinued as an economy and conservation measure, except for places where erosion or lack of drainage



Public Roads Administration Photo

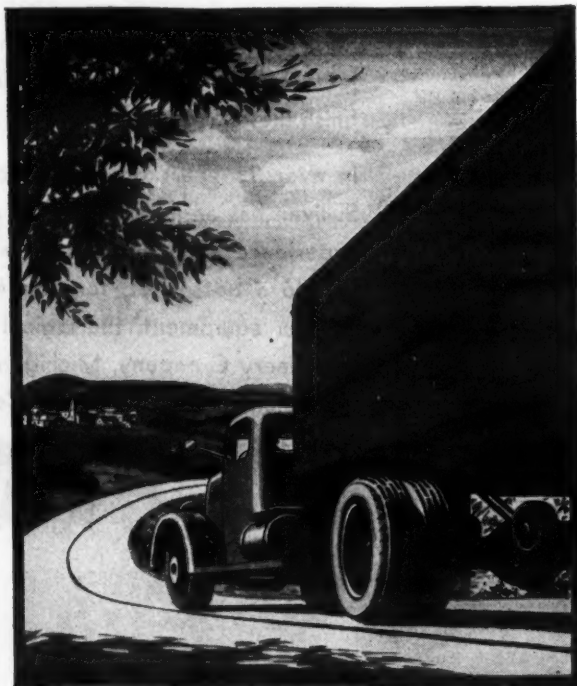
Wartime erosion control on highways in Connecticut. Spreading of the mulch will be followed by light covering with soil and seeding. Cut slopes are mulched with grass cuttings, the spreading of which is followed by a light covering with soil and seed.

threatens to cause extreme damage to the highway. In such cases when repairs are necessary, it is more economical to do a complete job of erosion control, if at all

possible, to prevent recurrence of the same trouble, which is likely if only makeshift repairs are made.

(Continued on page 48)

## For a Quick Recovery



"Quick Recovery" is the job of the Heavy Wreckers built by Ward LaFrance for the armed forces. When a tank, truck, or half-track is put out of action, these rugged trucks go out and get them. They bring 'em back through sand, muck and rocky terrain, over nearly impossible trails or, often enough, cross country.

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If your fleet has suffered from lost tonnage due to wartime lack of trucks, Ward LaFrance trucks are the best prescription for quick postwar recovery. Whether your needs call for dump trucks, over-the-road tractors (gasoline or Diesel), or vehicles engineered to your individual needs, Ward LaFrance offers your best profit opportunity. . . . A plan developed particularly for fleet owners makes it possible for you to take full advantage of the rugged power and dependability of Ward LaFrance trucks on a basis which will cut the cost of transportation to the bone.

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## Flood-Control Dam To Protect Houston

(Continued from page 15)

were used. In some of the drier sections, the bottom 3 feet of the dam was placed by scrapers but this procedure could not be followed regularly.

Four Northwest draglines and one Bucyrus-Erie with 70-foot booms handled three Hendrix and two McCaffrey dragline buckets, assisting the larger Monighans, which operated on the berm at the toe of the dam, to obtain dirt from the back sides of the borrow pits. Three Caterpillar D8 tractors with 15-yard scrapers, three 15-yard Tournapulls, two Caterpillar DW-10 tractors with scrapers, two pusher tractors, one Caterpillar D8 tractor with a bulldozer, and one motor patrol were used for moving material beyond the reach of the draglines.

Operations were continuous both day and night. Light for night work was furnished by four Kohler 1.5-kw light plants. These were enclosed in small houses mounted on 8-inch pipe skids which also carried pipe towers 20 feet high on which were placed four adjustable reflectors.

A complicating factor in the construction of the dam was the presence of four pipe lines whose crossing necessitated special construction. Each line had to be set in a casing having a diameter at least 4 inches larger, vented at their lower ends, and equipped with seep rings at 20-foot intervals. The seep rings consisted of a 3-foot-square steel plate encased in a 6-inch concrete wall 6 feet square. The material backfilled around these lines and seep rings was compacted by Ingersoll-Rand pneumatic tampers.

A gravel road 12 feet wide and 6 inches deep was constructed on the crown of the dam by placing gravel shipped in from commercial producers.

The topsoil which was stockpiled before construction commenced was loaded by the smaller draglines and spread in a 6-inch layer over both slopes of the dam by bulldozers as the finishing operation.

### Major Quantities

Clearing	1,500 acres
Grubbing	230 acres
Stripping	558,000 cu. yds.
Excavating borrow	3,055,000 cu. yds.
Excavating channel	882,400 cu. yds.
Excavating drainage ditches	735,000 cu. yds.
Excavating structures	35,850 cu. yds.
Fill, embankment	3,474,000 cu. yds.
Fill, channel rectification	295,500 cu. yds.
Spot sodding	86,400 squares
Top soil	145,900 cu. yds.
Gravel (road surfacing)	109,700 sq. yds.
Corrugated-metal bituminous-coated pipe, 36-inch	1,190 lin. ft.
Stone riprap paving	2,000 cu. yds.
Concrete	6,473 cu. yds.

### Personnel

Contracts for the earth work, outfall channel and spillways at Barker Dam, Houston, Texas, were awarded by the Galveston Office of the U. S. Engineers to Macco Construction Co. of Clearwater, Calif., who started work on February 2, 1942. This construction, amounting to \$2,133,064, was completed on October 31, 1944. S. T. Corfield was Superintendent for the contractor. Norman W. Brown was Resident Engineer for the U. S. Engineers on the project, assisted by W. S. Emley, P. G. Middlebrook, and a corps of inspectors. The work is under the general supervision of Lt. Col. John H. Anderson, District Engineer, and Major Kenneth M. Smith, Chief, Operations Section, of the Galveston District Office.

### Eno Foundation Names New Editorial Director

Roscoe Ellard, magazine writer and professor at Columbia University since 1940, has been appointed to the newly created post of Editorial Director of the Eno Foundation for Highway Traffic

Control. Mr. Ellard is the author of several books, and is now directing a research project in public opinion at Washington, D. C. He took over his duties at the Eno Foundation on October 1.

The Eno Foundation, located at Saugatuck, Conn., has been affiliated with Yale University since 1933. It is a study center for traffic control throughout the world; holds national conferences of traffic engineers, enforcement officers and road builders; and carries on research in traffic control. Published proceedings of its recent conference in New York are now available for distribution.

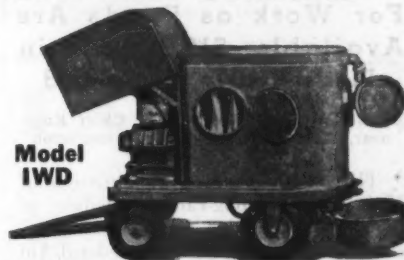
### Hazard Wire Rope Names New N. Y. Sales Manager

Russell H. Foss has been appointed District Sales Manager for the New York District of Hazard Wire Rope Division of the American Chain & Cable Co., Inc. Mr. Foss, who has been connected with the company since 1938, will continue to make his headquarters at 230 Park Ave., New York City.

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- 4 When applied as industrial unit, collects dust accumulations that are costly and apt to be a hazard both to men and equipment. Keeps your plant, motors and machinery free from harmful dusts.
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DRAGLINES, VARIABLE



# Highway Program In State of Maine

**Long-Range Road Schedule  
For Work as Funds Are  
Available; \$12,929,300 in  
Plans Nearly Completed**

By LUCIUS D. BARROWS, Chief Engineer, Maine State Highway Commission

THE State Highway Commission of Maine has a long-range schedule of highway and bridge construction projects, located on both the Federal-Aid primary and secondary highway systems and on the state highway system, the estimated cost for which is approximately \$68,700,000. This program includes approximately 730 miles on the Federal-Aid primary system, 903 miles on the F-A secondary-highway system, and 94 miles of state highways not designated as part of the Federal-Aid system. It also includes approximately 225 bridge projects of various sizes, ranging in cost from \$2,800 to \$700,000.

It is believed that the projects in this schedule should be constructed in the future in order to make Maine highways more nearly adequate for the anticipated needs of highway transportation. Many years will be required to carry out the work contemplated, but it is planned to select from this overall program projects for immediate construction as fast as funds are available.

## Status of Planning

As of October 1, 1944, surveys and plans were under way for sixty-one projects on the Federal-Aid system, totaling 274 miles, for which the total estimated cost is about \$13,052,000. Surveys and plans for thirty-three Federal-Aid projects on the F-A secondary-highway system and other roads are also under way, involving 47 miles, for which the estimated cost is \$1,601,000. Preliminary engineering work has been undertaken for the construction of forty-two bridges to cost a total of \$4,053,000. The work involved in this program includes the reconstruction of old highways, filling in gaps between projects previously constructed, and relocations of sections to improve alignment and grades. It is estimated that work in urban areas, the plans and surveys for which have already been undertaken, totals approximately \$4,700,000.

At the present time, of the sixty-one projects on the F-A highway system, the plans are 75 to 100 per cent complete for fifty-five projects, for an estimated cost of \$9,087,000. Of the thirty-three F-A secondary highway projects, plans are 75 to 100 per cent complete for twenty-six projects, estimated to cost \$1,271,000. Of the forty-two bridge projects, it is estimated that plans are from 95 to 100 per cent complete for thirty-one structures, which will cost an estimated \$2,571,300.

This work has been carried on under difficulties, as the engineering personnel in the Department has been about 25 per cent of the number usually employed in normal times. A few of the men who left for war work have recently returned to the Department.

## Financing the Program

Maine does not have funds allocated separately for design, right-of-way, and construction. Appropriations are made for the construction of state highways, secondary F-A highways, bridges, etc., and from these appropriations the Department must match Federal-Aid funds, pay the cost of right-of-way and of engineering. It is believed that Maine has ample funds to finance the preliminary engineering work for a post-war program contemplated by the Federal-Aid

acts which have been proposed up to this time.

However, it will be very difficult for Maine to match Federal funds for construction on any basis exceeding 25 per cent state funds to 75 per cent Federal funds. There are certain state activities which must be carried on, such as the maintenance of the roads already in existence, snow removal, and administration, plus the obligations of interest and retirement of bonds. To match the Federal funds which have been proposed by recent Federal bills will, in our opinion, require bond issues by the state.

## Right-of-Way Acquisition

Right-of-way has actually been secured for only about 8 miles of new road, as it has not seemed a good policy to tie up funds in right-of-way until there is more definite knowledge of what the program will be. Under Maine laws, it is expected that rights-of-way can be secured without great delay when the need arises.

## New Express Highway

In addition to the work previously outlined, the Maine State Highway Department has undertaken preliminary engineering, including the surveys and plans, for an express highway between Portland and Kittery, a distance of about 45 miles. This work is being carried on in cooperation with the Public Roads Administration.

Should this highway be developed as

a toll road by the Maine Turnpike Authority, which was created under an act passed by the Legislature in 1941, it is anticipated that the plans would be sold to the Turnpike Authority. This act authorizes the Authority to construct and operate a toll highway between Kittery and Fort Kent, Maine. A very rough estimate of this Portland-to-Kittery project indicates the cost to be about \$10,000,000.

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right. They are made by the manufacturers of Rex Mixers, Moto-Mixers, Pavers and Pumpcrete which have been outstanding performers in the construction field for many years.

For information on Rex Pumps, send for Bulletin No. 433. And check the other Rex construction equipment: Mixers, to cut concrete placing costs; Moto-Mixers that speed the mixing, hauling and placing of concrete... Pavers that can give you really heavy yardage production faster—Pumpcretes, the pumps that pump concrete by pipeline. See your Rex Distributor or write to Chain Belt Company, 1666 W. Bruce St., Milwaukee 4, Wis.



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The rig used by a Texas Highway Department District Shop to sharpen blades.

### Sharpening Machine Renews Worn Blades

A shop-built machine used by the Corpus Christi District Shop of the Texas Highway Department has proved most effective and economical for sharpening worn stalk-cutter and grader blades.

On a working table made of a 16-inch I-beam with 4-inch pipe legs welded to its corners is mounted a movable carriage carrying a 1½-hp electric motor, a 10-inch Aloxite grinding wheel with a 1½-inch face, and the necessary shafts, pulleys, belts, and gears. The gear rack from an old blade grader was welded to one flange of the I-beam to furnish a track on which the movable carriage travels from end to end of the blade being sharpened. Travel is automatically reversed at the end of the track and can be adjusted to the length of the blade in the rack.

A ¾-inch pipe rotates in loops welded to the table top, with its circular movement controlled by pipe nipples turned up from elbows at its ends to act as handles. Near each end, clamps made of ¼ x 1½-inch steel straps and welded to the ¾-inch pipe at right angles to its length hold the blade in position parallel to the travel of the moving carriage, and the operator, by moving the handle of the blade holder, puts the blade being sharpened against the moving grinding wheel with the desired pressure.

Two round trips of the moving carriage have proved sufficient to sharpen even the dullest blade and, during the present scarcity of new blades, the machine has been able to pay for itself many times.

### Montana Office Opened By The Asphalt Institute

A new District Office of The Asphalt Institute, New York City, has been opened in the Gullard and Wilkins Building in Billings, Mont., with John R. Banning as District Engineer. The territory to be covered from this office comprises Montana, eastern Washington, Idaho, Wyoming, North Dakota, western South Dakota, and Utah.

Mr. Banning's engineering experience, extending over the past twenty-one years, began in the engineering department of the City and County of Denver in 1923, where he served successively as laboratory technician, office engineer, and Assistant Superintendent of the Paving Division. He resigned in 1933 to become Project Engineer for the U. S. Bureau of Public Roads in charge of the construction of the northeast entrance to Yellowstone Park, and the bituminous-mat construction on the Canyon-Tower Falls highway over Dunraven Pass.

From 1935 until his appointment as District Engineer of The Institute, Mr. Banning, as Highway Commissioner of the City and County of Denver, has been in charge of the seven divisions. Besides supervising all the routine work of the

various departments, he had the direct responsibility of designing and construction of such major projects as the Municipal Airport, Jones Pass Water Diversion, Platte River freeway, flood-control dams, etc., on the Platte River and Cherry Creek, and all relief projects on paving and widening.

### Putting Night Punch Into Warning Signs

The tremendous volume of wartime highway traffic which requires many drivers to pilot trucks over new routes with heavy concentrations of traffic, cross traffic and merging traffic, has forced highway engineers to increase the number of reflectorized warning and direction signs. There will be an even greater volume of traffic in the post-war days for which many highway engineers are now planning.

The use of Scotchlite reflective sheeting for backgrounds or for letters to give signs 24-hour visibility was extensive in

pre-war days, has increased during the war emergency, and the manufacturer, Minnesota Mining & Mfg. Co., 900 Fauquier Ave., St. Paul 6, Minn., expects it to be even more extensive in the post-war era. Scotchlite is furnished in 12 or 24-inch 50-yard rolls or cut-to-size sheets to suit the particular needs of a highway department. It is offered in four colors, silver, white, yellow or red, and is readily adaptable to every type of painted

wood, metal, Masonite and plywood highway traffic sign or marker, to guard rails, to bridge and underpass approaches, and for marking maintenance vehicles which may be out at night.

Complete information on Scotchlite reflective material, with numerous illustrations showing applications, will be found in a yellow and black covered 12-page bulletin which may be secured direct from the manufacturer.

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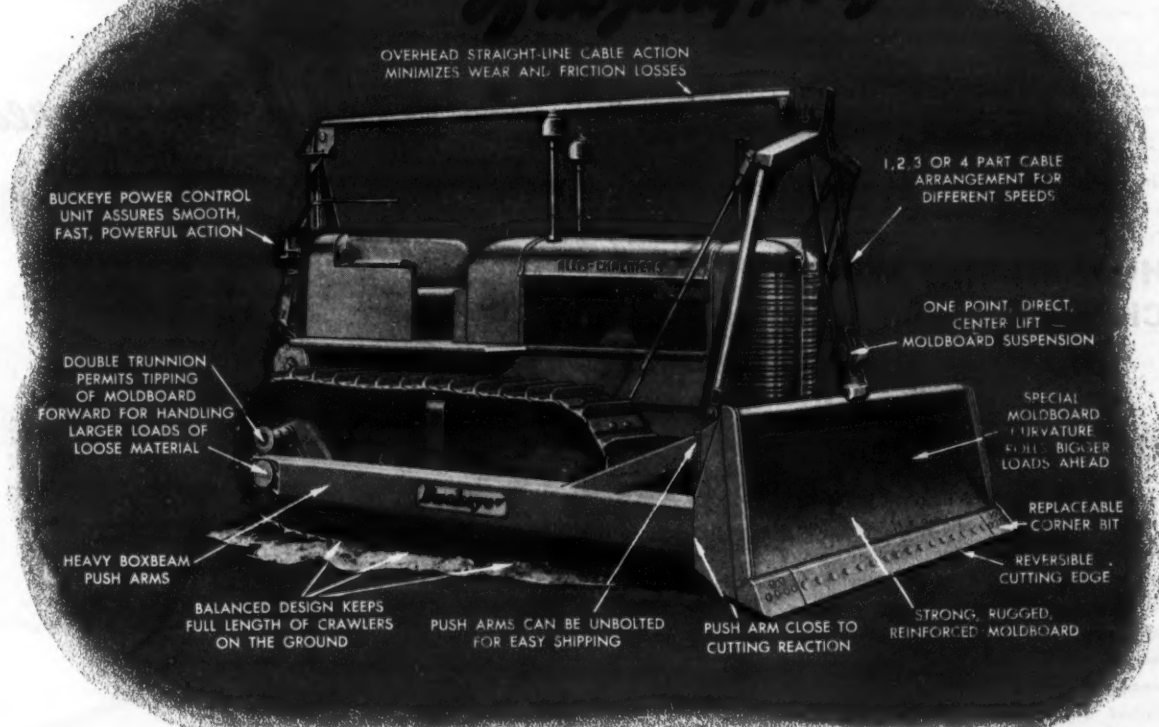
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Rear view of bulldozer moldboard shows large, closely spaced, moldboard ribs which assure permanent rigidity.



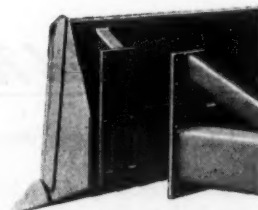
### REINFORCED PUSH PLATE

Worm's eye view reveals large number of heavy, supporting ribs reinforcing push plate for toughest dozing jobs.



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Push arms can be easily unbolted to save shipping space and facilitate handling. Note large bolting areas which provide the rigidity of one-piece unit.



ALL these features are the result of thoroughly engineered design combined with high quality of material and exceptionally rugged construction which enable the new Buckeye cable-controlled dozer to outperform all others. It is strong and rigid enough to take the full power of the tractor on one corner of the moldboard without permanent deflection. Rolling bigger loads, uprooting trees and stumps, digging out boulders, levelling, back-filling, grading in all kinds of ground conditions are everyday jobs for the new Buckeye dozer. There's never more than the minimum of lost time for repairs and maintenance. Here's your postwar bulldozer ready now!

Write for specifications.

**THE BUCKEYE BULDOZER & DITCHER CO.**

Findlay, Ohio



## Ultimate Road Costs Guide to Road Plans

(Continued from page 19)

mile, which we will assume suffers an annual loss of 100 tons of metal per year and therefore requires an annual expenditure of \$250 for scarifying, blading, etc.

This roadway surface might be reconstructed by scarifying and mixing it with the subgrade material, followed by a shot of  $\frac{1}{2}$  to  $\frac{3}{4}$  gallon of road oil with an application of chips, at an assumed cost of \$500 a mile. In such a case the annual maintenance cost might be expected to drop from \$325 per mile in the second year to become stabilized at \$125 in the fourth or fifth year.

The surface-treatment method would mean an initial cost of \$1,000, with a retreatment costing \$400 every other year. The low-cost surface course is assumed to require \$4,000 per mile, with the assumption that at the end of 10 years \$500 would be required to reseal.

Comparison of Ultimate Costs  
(15-Year Period—2 Per Cent Interest—No Salvage)

Year	Untreated	Road Oil	Surface-Treated	Surface Course
1	\$ 250	\$ 875	\$1,000	\$4,000
2	250	325	400	...
3	250	250	...	...
4	250	175	400	...
5	250	125	...	...
6 & 8	250	125	400	...
7 & 9	250	125	...	...
10	250	125	400	500
11, 13, & 15	250	125	...	...
12 & 14	250	125	400	...
Total	3,750	3,000	3,800	4,500
Accrued interest, Compounded	666	705	836	1,543
Total Annual	\$4,416	\$3,705	\$4,636	\$6,043
	\$ 294	\$ 247	\$ 309	\$ 403

The following conclusions can be

drawn: (1) The preparation of the base and its treatment with road oil require the expenditure of \$700 of additional money in the first two years, but save \$711 in 15 years or \$53 per year, plus highway users' benefits of a dust-free, smooth, and more weatherproof roadway; (2) Surface treatment requires an added outlay of \$900 in the first two years, costs \$220 more over a 15-year period, or \$15 per year, than the untreated base, with the difference charged to users' benefits; (3) The low-cost surface course would require an added expense of \$3,750 in the first year, would cost \$1,627 more in 15 years, or \$109 per year must be charged to users' benefits. In the last mentioned case, salvage or usable value remaining in the surface course would probably place it between the road-oil and surface-treatment methods in ultimate cost.

The benefits to road users may take the form of reduced operating costs, and more days per year of use by eliminating temporary closings for repairs or when frost is coming out of the ground, a condition that would probably be eliminated through the extra thickness supplied by the surface course.

### Why Isn't It Done?

If more economical road service can be supplied by added investment, why isn't it done? There are at least two reasons, one of which is the unfounded prejudice the average voter has toward paying interest, and the second is the encouragement that has been given to the idea that soon there will be unlimited Federal funds available.

The matter of interest consciousness can be traced to the difficulties which the farmer or small-home owner has had in meeting a 6 per cent mortgage

payment. He is unaware that the going rate for political subdivisions is 2 per cent or less. At present public officials are reluctant to ask for sufficient funds for they are met with the argument that it is foolish to borrow money on your own account when funds may be forthcoming from the Federal government. Credit should be given to General Philip B. Fleming, Federal Works Administrator, for his attempt to warn state and local governments that they must be prepared to share financially in their post-war public works.

### Post-War Plans

Public works may be defined as a reservoir into which an energetic and far-sighted people pour their surplus productive capacity when the channels of commerce become clogged, to the end that such public works may later make it possible to produce more with less work or to enjoy the fruits of their toil in productive enterprises.

Despite a great deal of shouting and running about, little progress has been

made in starting the rank and file of road-building agencies at the task of planning post-war public works, beyond talking about and filing inventories of needed improvements. The key to this jam is the role the Federal government can be depended upon to play, as sufficient Federal funds might make bond issues unnecessary. But before we go on with a "pay-as-you-go" policy, let's check up and see if it really isn't putting off until tomorrow the task which should be done today.

From a paper presented at the First Illinois State Asphalt Conference, Springfield, Ill., February 24, 1943.

### Promotions at Lima

The following promotions have been announced by the Lima Locomotive Works, Lima, Ohio: A. J. Townsend, Chief Mechanical Engineer, has been advanced to Vice President in Charge of Engineering, and Henry Barnhart, Manager of the Shovel and Crane Division, has been made Vice President in Charge of that Division.

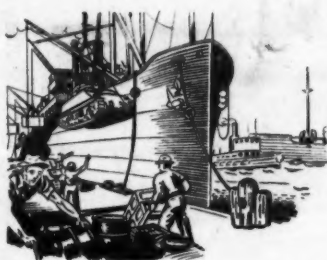
## HOW MARINE WINCH Clutch Developments HELP DESIGN More Powerful PIPE LINE BOOMS

Your new and improved products will benefit from the latest war-tested clutch and power take-off developments for handling heavy and unwieldy loads, if you put your power transmission problems up to our engineers. They are ready to contribute their more than a quarter century of clutch-building experience toward improving your post-war product designs and taking the kinks out of your production lines. By sending your specifications to us now, your requirements will be met without unnecessary delay when reconversion starts.

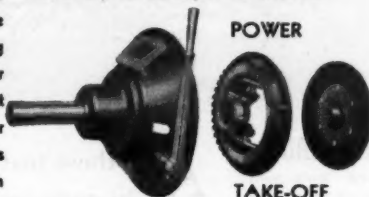
### SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION CONTROL

It tells and shows how  
ROCKFORD CLUTCH  
and POWER TAKE-OFF

applications are saving time, power and money in oil field equipment and a wide variety of industries. Gives capacities, dimensions and specifications.



## ROCKFORD



## CLUTCHES



## Rockford Drilling Machine Division

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Pullmore Multiple-Disc Clutches • Over-Center and Spring-Loaded Clutches • Power Take-Offs



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Briggs & Stratton 4-cycle, air-cooled gasoline engines—  
leaders in the field . . . Preferred power—

based on the performance record of over 2,000,000  
of these engines with their watch-like precision . . .

the result of twenty-five years of continuous production,  
plus constant research and refinement.

Air-Cooled Power

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Preferred Power, by manufacturers, by distributors and dealers, by owners and users . . . for hundreds of uses and applications . . . because of trouble-free performance, easy starting, and economy of operation. Because of year after year of dependable service with minimum care or attention. We are now ready to help you plan for peacetime production of gasoline powered equipment, tools and appliances. BRIGGS & STRATTON CORP., Milwaukee 1, Wisconsin, U. S. A.





The new Gar Wood winch for front-mounting on tractor or truck.

### Front-Mounted Winch For Trucks, Tractors

A front-mounted winch, more than 150,000 of which, mounted on trucks, have already been shipped to the armed forces, has been developed by Gar Wood Industries, Inc., 7924 Riopelle St., Detroit 11, Mich., in cooperation with Army experts. The winch is mounted in front of the truck radiator instead of

high on the chassis back of the cab as has usually been the custom. This position makes it possible for the vehicle to pull itself out of almost any predicament by its own power. The installation utilizes the full power of the winch without the loss in efficiency of other mounting which made it necessary to pass the cable over sheaves in order to obtain forward pulling power.

As soon as military needs are supplied, these winches will be available for mounting on contractors' and highway department trucks and tractors. Complete information may be secured direct from the manufacturer.

### The Damerons Pull Out

An announcement has been received from C. I. Dameron and Gordon H. Dameron that they have sold their entire interest in the firm of Dameron & Kenyon, Inc., levee and dirt-moving contractors, of Port Allen, La., and now have no connection whatsoever with that corporation.

### Koehring Publishes New Paver Instruction Book

A new 8-page instruction book has been published by the Koehring Co. on the operation of the Twinbatch 34-E paver. This book gives detailed information about the care and maintenance of this equipment, with diagrams of how to make necessary adjustments. Copies may be obtained by writing to the Koehring Co., 3026 W. Concordia Ave., Milwaukee 10, Wis.

### New I-H District Mgr. Appointed for South

The appointment of Karl W. Freeman as Southern District Manager has been announced by the International Harvester Co., of Chicago, Ill. Mr. Freeman, who has been serving as Branch Manager at Atlanta, Ga., has been associated with the company since 1925, having been connected with branch offices in Des Moines, Council Bluffs, Amarillo and San Antonio.



Clamp - Splice - Tie -  
Repair - Mend - Reinforce

with  
**PUNCH-LOK**  
Streamlined  
BANDING METHOD

In all types of industry—production, maintenance or service—Punch-Lok Banding Method is at work . . . connecting hose, stopping leaks in steam or water lines, splicing electric cable, reinforcing and mending splits in cross-arms, poles and ladder rails, tying rigid conduit or flexible cable to pipe lines or girders, seizing ends of wire or manila rope to prevent fraying . . . in short, wherever a banding method can be used to connect, mend, splice or reinforce. Open end bands available for use when ends of work are obstructed. There are places in your industry where Punch-Lok Clamps would save you time and money.



**CLAMPS** . . . Made of flat, high tensile galvanized steel or of Everdur, which is a corrosion resistant copper base alloy. All clamps are double wrapped. Available from 3/4" to 48" I.D. Any larger size clamp can be pulled down to fit any smaller diameter.

**LOCKING TOOL** . . . Sturdily constructed to assure long life. Locks all size clamps with a sufficient tensional pull.

**GROOVED FITTINGS** . . . For hose lines—air, water, steam or any other fluids. Permits application of high pressure clamping without damage to hose.

★ Write for Descriptive Catalog and Name of Local Distributor



## This Might Happen to You



**SNAP!!**—a vital part just gave way on this important job. It looked like a 10 day delay if the part had to come all the way from the factory. The contractor faced a \$600 rental loss and besides, the job would be behind schedule by some 3840 yards of concrete.

**But thanks to** a nearby A. E. D. member the part was replaced within 8 hours. The contractor lost only \$60 rental cost and the job was set back only 384 yards.

Unexpected things like this happen to the best of machinery, but when they do, remember, the manufacturers have wisely made sure their machinery is distributed and serviced by reliable Associated Equipment Distributors. More than 500 A. E. D. members are ready to give you "Neighborhood Service" and have the proper facilities to repair or rebuild quickly and locally any piece of their equipment that gives way under extra wartime abuse.

Learn to know your nearest A. E. D. Members and use their services.

**ASSOCIATED EQUIPMENT DISTRIBUTORS**

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**LOOK FOR THE A.E.D. INSIGNIA—THE SYMBOL OF GOOD SERVICE**

Look for  
the A. E. D. Emblem  
of Good Service.



### THE MORE

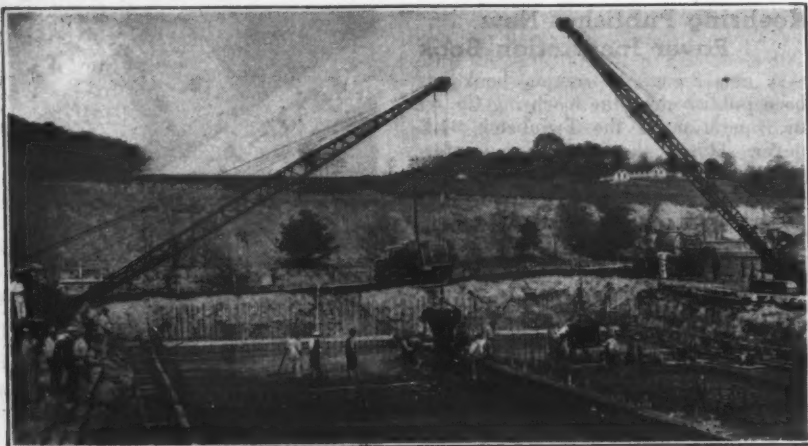
... Products You Make  
... Bonds You Buy  
... Material You Save

### THE MORE

... Of Our Boys Will  
Return From  
Service.  
Will YOU Help?

**6th WAR LOAN**





Concreting operations at the extension to the water filtration plant for the American Enka Corp. plant near Asheville, N. C.

## Handling of Concrete For Enka Filter Plant

A recently completed addition to the filter plant of the American Enka Corp. at Enka, near Asheville, N. C., will increase the daily volume of filtered water for processing, to meet the greatly enlarged war demands for Enka products, by 4,000,000 gallons. The contract for the concrete for this addition, as well as a sewer and water line 6 miles long of 30-inch pipe, was awarded to Reed & Abee, contractor of Asheville, N. C., who started the work last winter and will complete it before the end of the year. The contract calls for the pouring of about 10,000 cubic yards of concrete. The best day's pour has been 741 yards.

The contractor used on this job four Bucyrus-Erie cranes with shovel and other attachments, three Allis-Chalmers tractors, eleven truck-mixers, Rex

pumps, a cement plant and batching facilities.

The fleet of eleven Rex Moto-Mixers hauled the concrete to the site of the job shown in the illustration and delivered it to a 33-cubic-foot bottom-dump concrete bucket handled by a Bucyrus-Erie 22-B crane with a 60-foot boom, shown at the left, and a 22-cubic-foot bottom-dump concrete bucket swung by a Bucyrus-Erie 15-B crane with a 50-foot boom, seen at the right. The concrete was vibrated by a Chicago-Pneumatic vibrator, air for which was supplied by a C-P compressor.

The work was done, under the direction of J. Heykoop, Chief Building Engineer of the American Enka Corp., by Reed & Abee, with W. F. Ingle and A. M. Brown as Superintendents on the job. Mark Reed is President, Hugh Abee, Vice President, and J. D. McGahey, Secretary-Treasurer of the contracting or-

ganization. The illustration was furnished by Reed & Abee through the cooperation of E. F. Craven Co., road-building machinery distributor of Greensboro, N. C.

## Double Reproduction With New Copyflex

New reproduction advantages are offered by a machine recently announced by the Charles Bruning Co., 4700 W. Montrose Ave., Chicago, Ill. This machine, the BW-Copyflex Model 2 continuous printer, makes it possible to duplicate anything drawn, typed, printed or illustrated, as well as to make contact prints. With the use of Copyflex materials, this continuous printer exposes tracings, line drawings, specifications, Van Dyke negatives, blueprints, etc.

Original material with copy on both sides can be reproduced on either side or both sides. Copyflex prints are developed in trays and dried in a simple unit. With the flick of a switch, the Model 2

becomes a contact printer for exposing black and white prints. Another new Bruning machine, the Model 153-M BW Developer, is used for developing the contact prints exposed on the Model 2.

Compactly designed, the Copyflex printer fits in desktop space. It exposes roll stock or cut sheets up to 24 inches wide at a speed of 5 to 30 inches per minute. Because it is a continuous printer, speed of reproduction is increased.

Complete information on these machines for engineering office use may be secured direct from the manufacturer by mentioning this news item.

## Mike Radich Carries On

Mike Radich, formerly of the contracting firm of Radich & Brown, which has been dissolved, has formed a new company to be known as Mike Radich & Co., 3000 Empire Ave., Burbank, Calif. This is a co-partnership consisting of Mike Radich and Edwin Fergusson and will continue its membership in the Associated General Contractors of America.

## Bigger Bites

...even in wet digging!



WITH THE *Lightweight*

★ 3 Types, 1/2 to 30 Cubic Yards

Light, medium and heavy duty.

★ 20% to 40% Lighter Than Other Buckets

Permits greater ease of handling.

★ All-Welded Construction

No rivets to work loose.

★ 10% to 14% Manganese Steel

Chains and all fittings.

No matter what the digging conditions may be, the Hendrix Lightweight naturally moves more material, and moves it faster! It is a bucket that is light, yet strong... easy to handle on small machines or on long booms.

The round perforations which reduce excess weight also serve two other worthwhile purposes: Eliminate vacuum to insure quick, clean dumping, and in wet digging full loads are maintained for the water remains in the pit.

Write for descriptive literature, or see your equipment distributor.

**HENDRIX**  
*Lightweight*  
**DRAGLINE BUCKETS**



HEWLETT-PAKES FOUNDRY, INC. - MANCHESTER, LOUISIANA



with

**HEIL**

*Cable Dozers*  
you get more  
**POWER to PUSH!**

## Proved performance in the toughest kind of service...

The Heil Cable Dozer is ruggedly constructed to clear the way... moving all obstacles that may be in its path. On this road project in Central America, even the larger trees gave way to a Heil Cable Dozer mounted on an International Harvester TracTracTor. This is just another example of how you can speed your jobs and increase your profits. You get more drive — more penetrating power... to do a clean cut job accurately, smoothly, and economically.

Heil Cable Dozers are engineered to give you the kind of performance you want. You're money ahead when you specify Heil Cable Dozers and other Heil Earth-moving units.

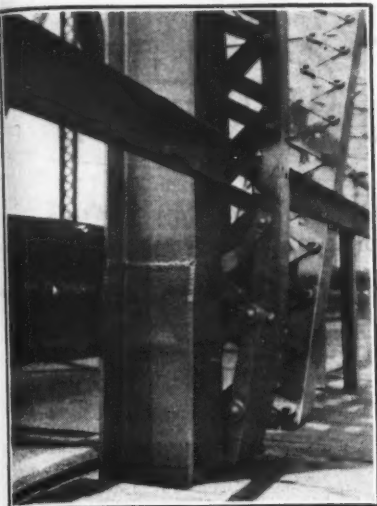
See Your INTERNATIONAL TracTracTOR DISTRIBUTOR



GENERAL OFFICES

MILWAUKEE 1, WISCONSIN





C. &amp; E. M. Photo

A damaged lattice column on a Texas bridge has a "crutch" of welded lengths of 10-inch steel beams of varying section to keep it in wartime service.

### Emergency Repairs To Bridge in Texas

Substitution and improvisation were necessary when a bridge across Arroyo Colorado, on the main highway between Harlingen and San Benito, Texas, was so seriously damaged by a collision occurring on it as to make it unsafe for heavy traffic. The structure consists of two 150-foot through trusses with 18-foot 8-inch panels and a 25-foot rise. The design included portal bracing and cross bracing of both top and bottom chords.

A side-swipe collision, in which one man was killed, occurred on the 20-foot roadway of this bridge and one of the cars involved was thrown against a 25-foot-long interior vertical member made of two 7-inch channels laced with  $\frac{1}{4}$  x 2-inch straps which carried a compressive stress of 39,000 pounds under a maximum H-15 loading. The impact crushed and twisted the member, forcing it 6 inches out of line laterally and 9 inches in a direction parallel to the center line of the bridge. It was not, however, torn loose from its end connections.

After telephone calls to all possible sources of supply, which in the aggregate cost more than the material desired, had elicited the information that the damaged member could not be reproduced for several weeks, it was decided to try substitution. A 10-inch 40-pound wide-flange beam, a 10 x 8-inch I-beam, and a 10-inch H-beam were located, no two of which were long enough to make the repair, so that it became necessary to weld all three together to form a piece of the required length. This was done by electric welding at the District Shop and, by the use of a light gin pole, the member was inserted between the top and bottom chords alongside the damaged strut which was left in place. The gusset plates fastening the old member to the chords were extended and arc welded to the substituted member and the bridge put back into normal service, after which the new member was painted.

### Plant Modernization Completed by Barnes

With the completion of new office space, the five-year plant-rehabilitation program of the Barnes Mfg. Co., pump manufacturer of Mansfield, Ohio, has been concluded. This program, inaugurated by M. H. Pryor, President, upon acquiring the company in 1939, called for modernization of the existing plant, expansion of the foundry, and the installation of new equipment.

This expansion of facilities has coincided with the company's increased production to meet wartime requirements, including adaptation of its self-priming centrifugal pumps for ship salvage and major conversion to the production of

brass fittings and fire-fighting equipment for the Navy and Maritime shipbuilding programs.

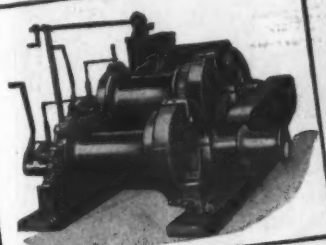
### New Rex Mixer Catalog

The Rex line of concrete mixers for the construction industry, ranging in size from  $3\frac{1}{2}$  to 28-cubic-foot capacity, is described in a new 12-page catalog. These mixers are reported to be simple in operation, being equipped with Easy-Arc controls to save back work and time, and are designed for long life and low maintenance. Another feature of standard equipment is the Batch Master Water System for accurately regulating the amount of water for the batch. Numerous illustrations are included in the catalog, as well as a discussion of operating features, and complete specifications.

Copies of Bulletin 446, describing Rex mixers, as well as literature on other Rex products, may be secured upon application to the Chain Belt Co., 1666 W. Bruce St., Milwaukee 4, Wis. Just mention this item.

## Hoists to Fit the Job

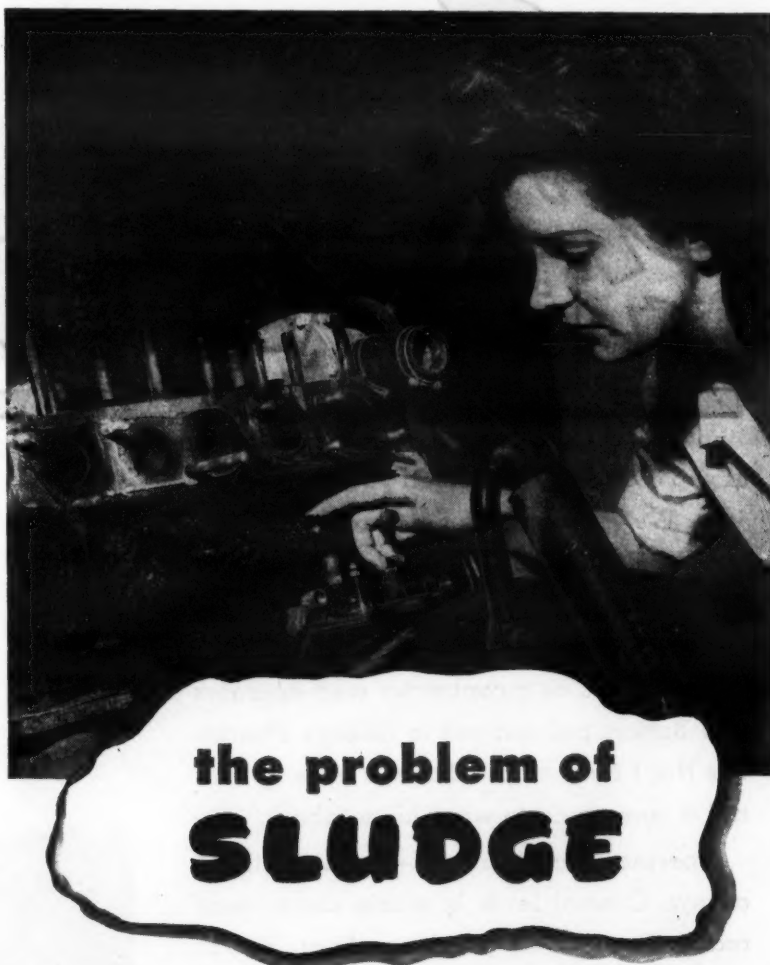
Lidgerwood hoists have earned a 70-year reputation for dependability and efficiency on the job. There's a Lidgerwood gasoline, steam, electric or Diesel hoist to fit every construction need. When you need a hoist inquire first of LIDGERWOOD.



**HOISTS FOR:**  
CABLEWAYS  
INDUSTRIAL PLANTS  
CONTRACTORS  
MINES—DOCKS  
RAILWAYS

**LIDGERWOOD**  
ESTABLISHED 1873

Manufacturing Company  
MAIN OFFICE AND WORKS • ELIZABETH, NEW JERSEY



## the problem of SLUDGE

IT IS well known among automotive engineers that engine deposits (sludge) cause stoppage of oil circulation, sticky rings, oil pump trouble and other serious damage resulting in overhaul time and expense.

Sludge either stays in suspension in the oil and causes the lubricant to become black, or it sticks to the motor parts and does its dirty work of destruction.

**LOW AND HIGH TEMPERATURE SLUDGE**  
There are two general types of sludge—that caused by low temperature operations and that by high.

Low temperature sludge is usually a semi-solid material with the consistency of soft mud. It is composed of oil mixed with water and fine particles of carbon, metal, dirt, dust or fuel gums.

"Stop and Go" operation with prolonged idling of the motor is a common cause of low temperature sludge. A leak in the water system surrounding the cylinders may also be responsible. Low temperature sludge clogs the oil lines and screens, resulting in burned out bearings and scuffed cylinder walls.

The principal difference between high temperature sludge and low is that the former contains large amounts of resins resulting from the oxidation of the oil in the crankcase. This type of sludge is comparatively free from water and soot.

High temperature sludge produces two different kinds of deposits in the engine. The granular or "coffee ground" sludge in the crankcase or oil pan and on the surface of the pump screen is well-known to mechanics. Varnish, gummy or lacquer-

like deposits that form on piston and ring faces and cylinder walls, because of high temperature oxidation of thin oil films, is another kind.

High temperature sludge is caused from prolonged high speed and engine operation, overloading the engine, clogged radiator or cooling system.



### HOW TO REMEDY SLUDGE SITUATION

Low temperature sludge can be easily recognized by simply heating some of the deposit on a piece of metal over a flame. If the material foams or sputters and crackles, then water is present. To remedy this, check for internal water leaks and raise the temperature of the cooling water to 160° to 180° and keep it there by means of radiator shutters or thermostats.

To remedy high temperature sludge, inspect radiators and water jackets and see that they are clean and free of mud and scale. Drain and flush crankcase frequently, especially in heavy duty service. Oxidation of the crankcase oil can be minimized by the use of oil coolers in heavy duty truck service. Keep the crankcase oil temperature below 200° F.

To prevent either type of sludge, keep the lubricating oil clean. Filtering is not enough. Frequent draining and flushing of the crankcase is essential. Drain oil while hot. Base drain periods on a type-of-use basis, rather than time or mileage interval. Keep both air and oil filters free from dust and other foreign matter.

**MACMILLAN RING-FREE OIL HELPS REDUCE SLUDGE**—One of your most effective sludge remedies is a good lubricating oil. Macmillan Ring-Free Motor Oil (for either Diesel or gasoline fuels) is so refined that it removes the carbon and sludge from the working parts of the engine. It cleanses as it lubricates. The deposits are kept in the oil in suspension and are drained off when you change oil. That's why Ring-Free is black when it's drained.

You'll be surer of fewer motor troubles with Ring-Free Oil.



**MACMILLAN  
RING-FREE  
MOTOR OIL**

Free Folder on Sludge—Its Causes and Cures  
Write today for your copy • Address: Macmillan Petroleum Corp.,  
530 W. Sixth Street, Los Angeles 14, Calif.

**MACMILLAN RING-FREE MOTOR OIL**

MACMILLAN PETROLEUM CORPORATION—50 WEST 50TH STREET, NEW YORK 20 • 624 SOUTH MICHIGAN AVENUE, CHICAGO 5 • 530 WEST SIXTH STREET, LOS ANGELES 14 • COPYRIGHT 1944, MACMILLAN PETROLEUM CORPORATION





Soil samples to determine the density of a compacted lift were removed by a post-hole auger on the Indiana soil-compaction test project.

## Soil-Sample Testing For Lift Compaction

(Continued from page 27)

ance of 1 of the optimum, as required by the specifications for this section. If the soil contained more than the specified amount, the soil was permitted to dry before compaction, using a disk harrow to facilitate drying and to pulverize the clods of soil.

If the soil did not have sufficient moisture to comply with the specifications, water was added by a pressure distributor. Each application of water, approximately 0.5 gallon per square yard, was mixed with the soil by a disk harrow. Water was added and the disking continued until the required amount of moisture was uniformly distributed through the soil. The lift was then compacted by the sheepfoot roller until it attained a density equal to at least 95 per cent of the maximum as determined by the compaction test.

Fill material for sections 2 to 8 was excavated from the borrow pits by power shovels and hauled to the embankment in 1½-ton trucks, spread by a bulldozer and power grader in layers of specified thickness, disked to pulverize the clods and loosen soil packed by equipment, and compacted to the required density by rolling. Moisture control was not used on these sections. When placed and compacted, the soil had a moisture content as it came from the borrow pit. At times when the soil contained too much moisture to permit the operation of the compaction equipment, it was allowed to dry until the rollers could perform satisfactorily.

### Ohio Methods Similar to Indiana

Since the Ohio project was located over an old road, it was necessary to remove the old road surfacing, the sod, and other objectionable material from the shoulders and side slopes before placing new fill. The widening was accomplished by placing material on each side of the old fill in horizontal layers of specified loose thickness. While the soil was being deposited on the one side, the material on the other side was compacted.

After the widening had been completed, the material for each lift was placed for the full width of the roadway. Hauling was not permitted over any lift until it had been compacted to the required density. Most of the fill material was excavated by power shovels, hauled to the embankment in dump trucks, and spread by a bulldozer in layers of specified thickness. The excavation, hauling, and spreading of the soil used in some of the lifts on sections 1, 8, and 9 were done by 12-yard dirt-moving scrapers. The soil layer was then disked to pulverize the clods.

The required moisture content was obtained in the same manner as described for section 1 of the Indiana project, after which the lift was compacted to the required density.

### Density of Lifts Determined

On both projects the number of trips that a particular roller was required to make in order to obtain the necessary compaction was governed by the specified density of the compacted lift.

The density of the compacted lift in the Indiana experiment was determined in the following manner: The location where the density test was to be made was shaped by a shovel to give a level surface. A soil-collecting box, 18 inches square, having a 4½-inch hole in the center, was set in place on the leveled surface and a hole was bored to the bottom of the compacted layer with a 4-inch post-hole auger which passed through the hole in the soil-collecting box. The box served to collect the soil which spilled through the sides and over the top of the auger while making the boring. This material, together with the soil removed by the auger, was placed in a bucket and weighed. The weight of the bucket, subtracted from the weight of the bucket and soil, gave the weight

(Continued on next page)



**SPECIFICATIONS:** The light plant consists of 1 portable generating unit (1-hp. air-cooled gasoline engine driving a 500-watt 125-volt direct-current generator) mounted on an all-steel hand truck; 2 portable service lights (200-watt and 150-watt); a 150-watt spotlight; three 20-foot extension cords, and a ½-gallon gasoline tank supplying the plant for four full-capacity hours.

**WRITE FOR CIRCULAR**

# LIGHT

Contractors find many uses for this  
**CLARK PORTABLE LIGHT PLANT**  
"the light that's always ready"

A self-sufficient unit that is mounted on a handy two-wheel truck, the Clark Emergency Portable Light Plant can be taken quickly to any location and supply 500 watts of electricity immediately. No batteries to recharge—no acids to spill. It gives you light in a hurry—wherever you need it—whenever you need it. Use it when other light sources fail—or when more light is needed. Use it also to power small tools such as electric drills, sanders, etc.

MANUFACTURED and SOLD BY  
**CLARK SUPPLY COMPANY**  
245 E. Keefe Ave.  
MILWAUKEE 12 WISCONSIN

# Easy Operate a BAKER

If you did, we need not tell you how simple it is. We've been talking about direct hydraulic lift and full down pressure on the blade and about the ease and low cost of maintaining Baker bulldozers and grade-builders. But, as a contractor who operates five Bakers pointed out to George Phares, our No. 1 field man—"Baker's ease of control is something to write home about."

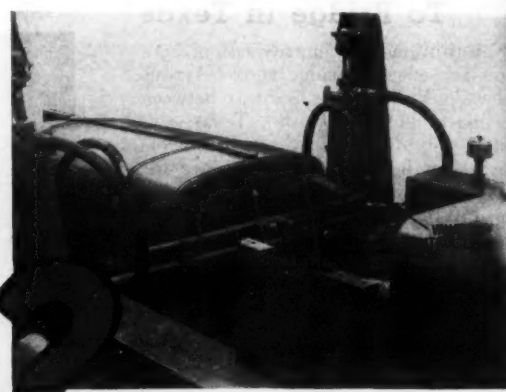
Operator faces forward—no need to sit askew. Control lever is within convenient reach. Four lever positions—float, down, hold, raise. Fast, positive action. That hold is important—you can put the blade in a cut and hold it there! On many occasions, especially where the going is tough, hydraulic down pressure is the operator's "ace in the hole."

Baker Bulldozers on Allis-Chalmers 2-cycle diesel tractors are making it easier for our fighting forces on every front.

### THE BAKER MFG. CO.

585 Stanford Ave., Springfield, Ill.

"If it concerns Victory, it concerns us"



FEATHER TOUCH  
PALM-FIT  
CONTROL  
LEVER



Top: Baker Bulldozer on Allis-Chalmers tractor clears floor of pit for buried fuel tank in South Pacific.

Bottom: Private Wally Saner, former Baker employee, removing snow at Alaska air base with Baker Gradebuilder which helped build base.

BULLDOZERS SNOW PLOWS

# BAKER

CONSTRUCTION EQUIPMENT



# Indiana-Ohio Tests Check Soil Density

(Continued from preceding page)

of the soil removed from the hole. For determination of the moisture content, a representative sample of about 80 grams was placed in a container and sealed. The moisture content was later determined in the field laboratory at Buckskin.

Standard Ottawa sand of known weight per cubic foot, loose measurement, was poured from a canvas sack into the hole. The combined weight of the sack and sand was determined before placing any sand in the hole. When the hole was filled to the top of the lift, the sack and the remaining sand were weighed. The difference between the two weights gave the weight of sand in the hole. The weight of sand required to fill the hole was divided by its weight per cubic foot to determine the volume of the hole. The weight of the soil removed from the hole was then divided by the volume of the hole to obtain the wet density of the compacted lift in pounds per cubic foot. The dry density of the compacted lift in pounds per cubic foot was calculated by the formula:

$$\text{Dry density} = \frac{\text{wet density} \times 100}{100 + \text{percentage of moisture in soil}}$$

With several exceptions the method used in Ohio was similar to that used in Indiana. Only the exceptions are noted here. Instead of the collecting box 18 inches square, a pan 14 inches square with a 4½-inch circular opening in the center was used. After the sample had been collected, a metal cover was fitted over the opening in the pan in order to prevent the loss of soil, the pan and soil were weighed, and the weight of the soil was calculated by subtracting the known weight of the pan from the combined weight of the pan and soil.

Standard Ottawa sand of known weight per cubic foot, loose measurement, was poured into the hole from a glass jar fitted with a detachable apparatus consisting of a metal cone, shut-off valve, and a funnel. The combined weight of the jar-cone apparatus and the sand contained therein was determined before placing the sand in the hole. The jar-cone apparatus was placed in an inverted position over the hole and the valve opened. The sand flowed until the hole and the funnel were completely filled. The valve was closed and the jar-cone apparatus with the sand remaining in it weighed. The difference between the two weights gave the weight of the sand in the hole and funnel. By subtracting the constant weight of the sand in the funnel, the weight of the sand in the hole was found.

## Moisture Control in Indiana

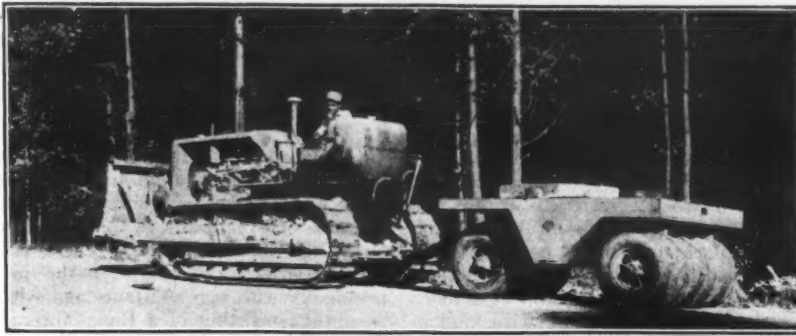
For moisture control on the Indiana



Complete Line  
of  
**DERRICKS**  
and  
**WINCHES**

**SASGEN DERRICK CO.**

3101 W. Grand Ave., Chicago 22, Ill.



The type of pneumatic-tire roller used in the experiments in Indiana.

project two samples were taken from each half lift on section 1, and the moisture contents of the samples were determined by drying them in pans over an open flame, care being taken to stir the soil constantly to prevent burning. The sample of about 80 grams was dried in approximately 10 minutes. Additional samples were taken from locations where visual inspection indicated important differences in moisture content.

When the soil of section 1 needed either wetting or drying to give it the specified moisture content, moisture determinations were made after each application of water or during the disking to expedite evaporation. It was seldom necessary to dry the soil placed in section 1. Of the twenty lifts comprising the fill seventeen required the addition of water in amounts ranging from 0.5 to 3 gallons per square yard.

## Compaction and Density in Ohio

The soil delivered to the fills on the Ohio project was obtained from the cuts and borrow pits in such a manner that it was a mixture of the materials represented by the samples for which moisture-density curves were determined. It was decided to adopt the method previously used with satisfactory results in Ohio when such variations were found. Selection was made from the group of curves available as a result of the tests made on samples from different parts of the cuts and borrow pits, using the one most representative of the material being placed.

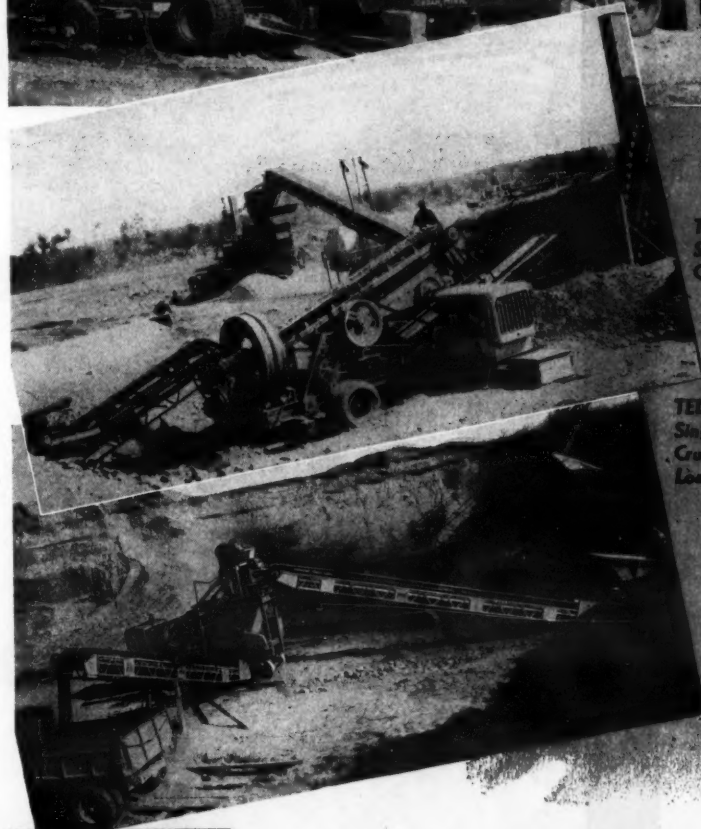
## Record of Construction Operations

In view of the experimental nature of the construction, an attempt was made to control the thickness of the fill layers as accurately as possible. The loose thickness of each lift was measured by taking elevations at the same spots before and after spreading the soil. The difference in the elevation was taken at

(Continued on page 64)



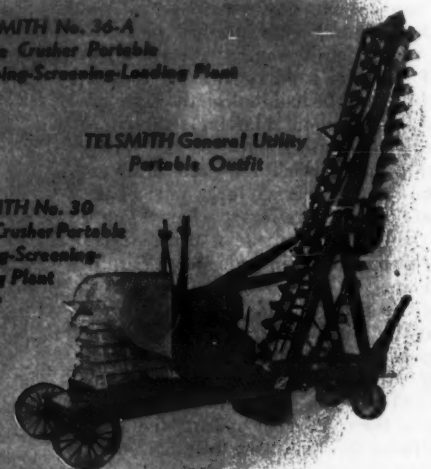
TELSMITH Dual Portable  
Crushing-Screening-Loading Plant



TELSMITH No. 36-A  
Single Crusher Portable  
Crushing-Screening-Loading Plant

TELSMITH General Utility  
Portable Outfit

TELSMITH No. 30  
Single Crusher Portable  
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For large capacity...  
with lowest operating cost  
**TELSMITH**  
PORTABLE CRUSHING PLANTS

with for PORTABLE CRUSHER GUIDE P-34

SMITH ENGINEERING WORKS, 4014 N. HOLTON STREET, MILWAUKEE 12, WISCONSIN

Cable Addresses: Sengworks, Milwaukee—Concrete, London

51 East 42nd St.  
New York 17, N. Y.  
Brandels M. & S. Co.  
Louisville 8, Ky.

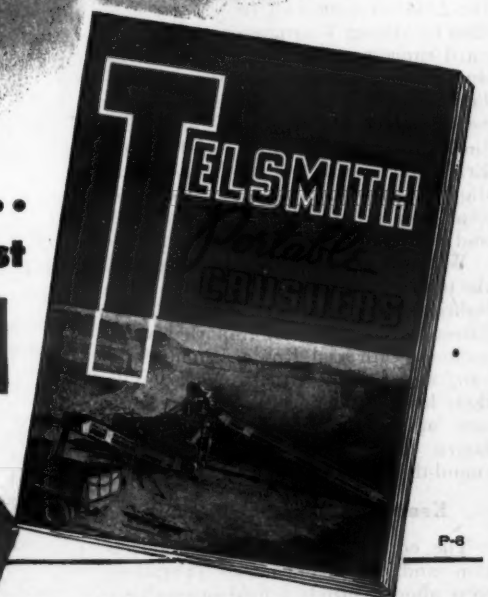
211 W. Wacker Drive  
Chicago 6, Ill.  
Risk Equipment Co.  
Charleston 22 & Clarksburg, W. Va.

715 Commercial Trust Bldg.  
Philadelphia 2, Pa.  
Risk Equipment Co.  
Roanoke 7 & Richmond 10, Va.

247 Third St.  
Cambridge 42, Mass.  
North Carolina Expt. Co.  
Raleigh & Charlotte 1, N.C.

Boehk Expt. Co.  
Milwaukee 3, Wis.  
North Carolina Expt. Co.  
Raleigh & Charlotte 1, N.C.

Mines Eng. & Equip. Co.  
San Francisco 4—Los Angeles 14  
Wilson-Weimer-Wilkinson Co.  
Knoxville 8 & Nashville 8, Tenn.



P-8



## Dirt Kept Moving On Navy Contract

**Equipment Selected to Meet Varied Conditions; Grease And Fuel Trucks and Field Shop Aid B. Perini & Sons**

MAKING effective use of varied types of earth-moving equipment, B. Perini & Sons pushed through a 3,250,000-yard job in slightly over four months as one of the subcontracts involved in the construction of an in-transit storage yard for Navy ammunition along the Atlantic seaboard, for which the Corbetta-Walsh Construction Co. is the general contractor.

Work was started the day the first pieces of equipment arrived at the site, which preceded by several days the issuing of the formal contract. No exact completion date was specified for the earth-moving and grading phase as such, but speed was of the essence so that concreting of the many structures involved could get under way, and as a result operations were carried out simultaneously at several different points in the 3-square-mile area where machines could get in. Only 5,000 yards were moved the first six days pending the arrival of all the contractor-owned and rented equipment, but from then on the daily yardage figures staged a steady rise until the peak figure of 57,791 yards was hit two and one-half months after starting. In the later stages, an unavoidable decline in daily yardage set in, due to more confined areas of work for the different crews. At the time the job was visited, near the start of the fourth month, just over 30,000 yards were being handled per day.

These figures were attained in a soil that was generally sandy with a few isolated layers of sand rock. Such rock as was hit could be handled by the scrapers or shovels without blasting. Cuts were mainly sand with some clay and water-bearing sand which required drainage ditches at the sides. A large part of the fill area was in a swamp, where from 0 to 4 feet of muck made it necessary to push a road ahead in order to get equipment in.

At the peak period there were some twenty-one cable-operated dirt-moving scrapers working the short hauls, six of them 33-yard LaPlant-Choates and the rest LeTourneaus. These were pulled by some of the contingent of forty-five tractors, three of which were Internationals, the rest Caterpillars. Medium hauls in the 2,000 to 4,000-foot range were handled by sixteen Tournapulls of 12 to 15-yard capacity, plus twenty-two bottom-dump Euclids. Some twenty-seven Sterling trucks took care of the longest hauls, being loaded by ten shovels and draglines, including Northwests, Bucyrus-Eries, and Lorains and two Lorain Backdiggers. Five Caterpillar graders were kept busy maintaining the supply roads and doing the necessary fine grading.

With the second shift operating until the tender hour of 4 a.m., effective flood-lighting equipment was essential, and fifteen light plants were imported which included Universal, Kohler, Onan, Sullivan, and K. R. Wilson models. With their help in making the job almost as safe at night as during the daylight hours, the dirt flew practically on a round-the-clock basis.

### Keeping Equipment Moving

The equipment fueling and lubrication and the maintenance operations were almost entirely a field proposition. Three greasing outfits, two Alemite and one Graco, constantly made the rounds, while one of the Sterling trucks was converted into a tank truck, with a Marlow 3-inch pump pressed into service to

pump fuel into the diesels out on the job. Three truck-mounted Westinghouse, G-E, and Hobart welding outfits rendered "first aid" for minor equipment breakdowns on location, while two 1½-ton Ford trucks equipped with steel rigs and 1-ton Yale hoists kept busy servicing the Firestone, Goodyear, and Goodrich truck and off-the-road tires.

More extensive repairs or dismantling of equipment took place near the field office in an 80 x 50-foot frame building, where a Westinghouse electric welder, spools of American Cable wire, and a Hypressure Jenny for steam cleaning gave further testimony to a heads-up maintenance policy. Drums of RPM

Delo, RPM tractor-roller lubricant, Sovac truck-bus oil, Texaco Marfak, and Mobilube were stored and used here for servicing all equipment.

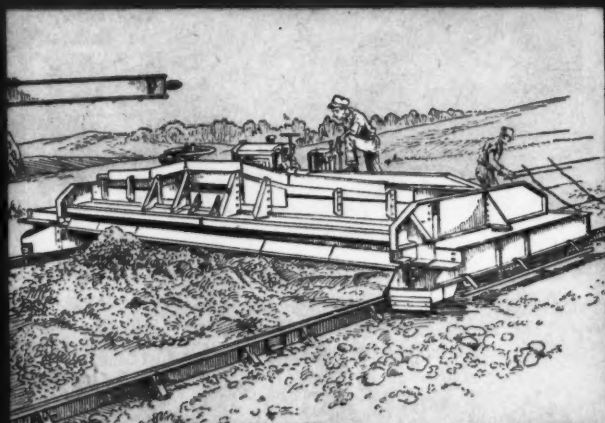
### Tractor Track Care

One unusual feature of the equipment maintenance was that all tractor press work was handled on contract to L. E. Edwards of Great Falls, S. C., who operates as the Great Falls Track Service Co. Mr. Edwards was present on the job personally with two assistants and with an outfit consisting of a Buda-powered Sullivan Zephair 110-foot compressor, an Ingersoll-Rand pneumatic hammer, an Airco acetylene cutting set, and a

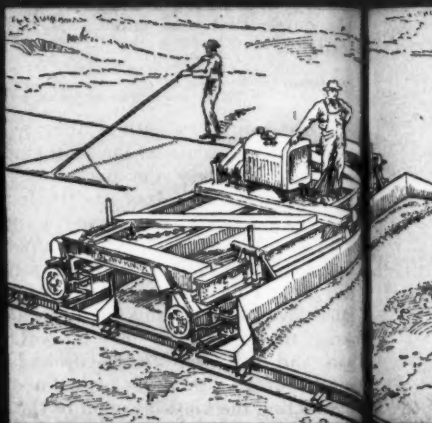
Bros track press. This press was so modified that it was not necessary to take the pads off any make or type of tractor in order to change the pins and bushings. Edwards figures this results in a saving of \$35 to \$50 per set of tracks in the cost of bolts alone, in addition to which the work can be done in from one-third to one-half the time necessary under conventional methods. Because of the sandy soil predominant in the area, every five or six weeks of work for a tractor made a new set of tracks and bushings mandatory, as a result of which constant use was made of Edwards' service by Perini and other Navy contractors engaged in

(Concluded on next page)

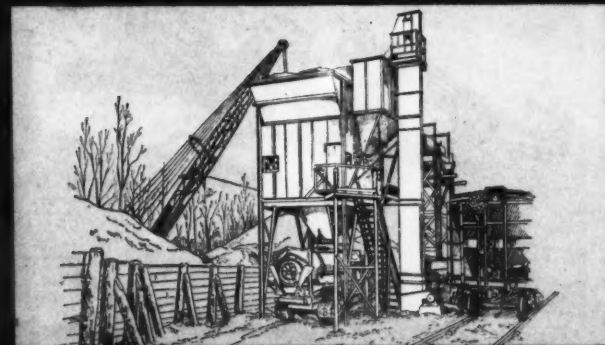
# BLAW-KNOX *has the answer*



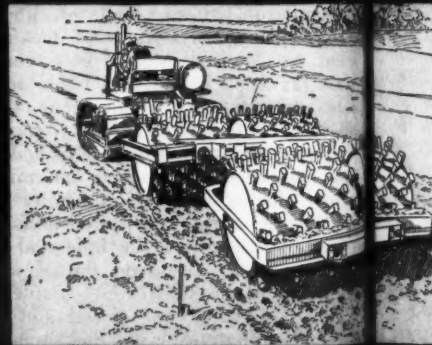
PAVING SPREADERS FOR AIRPORTS AND ROADS



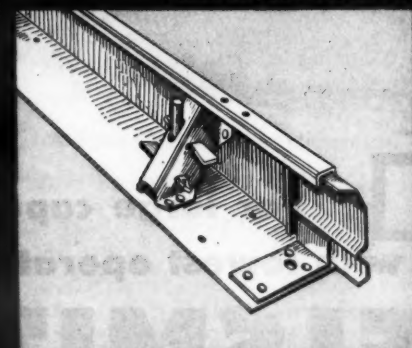
FINISHING MACHINES FOR AIRPORTS AND ROADS



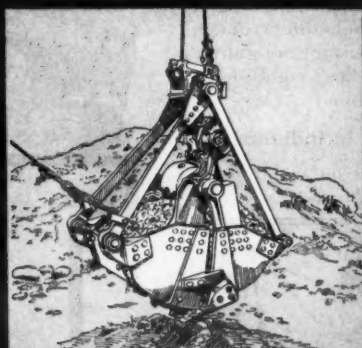
TRUCK MIXER LOADING PLANTS



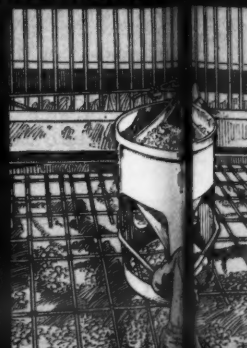
SHEEPSFOOT TAMPING ROLLERS



PAVING FORMS FOR AIRPORTS AND ROADS



CLAMSHELL BUCKETS



CONCRETE PUMPS

### KNOW YOUR BLAW-KNOX DISTRIBUTOR

**ALABAMA**  
Birmingham — Standard Con. Supply Co.  
**ARIZONA**  
Phoenix — State Tractor Equipment Co.  
**ARKANSAS**  
Little Rock — Lyons Machinery Company  
**CALIFORNIA**  
Los Angeles — Le Roi-Rix Machinery Co. & M. Orloff  
San Francisco — C. H. Grant Company  
**COLORADO**  
Denver — Ray Conson Machinery Co.  
**CONNECTICUT**  
New Haven — W. I. Clark Co.  
**DELAWARE**  
Philadelphia, Pa. — Glass & Ransome  
**DISTRICT OF COLUMBIA**  
Washington — Matt A. Dunlap Mech. Co.

**FLORIDA**  
Jacksonville — Florida Equipment Co.  
Miami — Florida Equipment Company  
Tampa — Epperson & Company  
**GEORGIA**  
Atlanta — W. C. Cape & Company  
**IDaho**  
Boise — Intercontinental Equip. Co.  
**ILLINOIS**  
Chicago — O. T. Christensen Co.  
St. Louis, Mo. — O. B. Avery Company  
**INDIANA**  
Indianapolis — Red-Holcomb Co.  
Chicago, Ill. — O. T. Christensen Co.  
Louisville, Ky. — Brandeis Mach. & Supply Co.  
**IOWA**  
Des Moines — Gierke, Robinson Co.  
Des Moines — Herman M. Brown Co.

**KANSAS**  
Kansas City — G. W. Van Koppel Co.  
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Louisville — Brandeis Mach. & Supply Co.  
**LOUISIANA**  
New Orleans — Southern States Equip. Co.  
**MAINE**  
Portland — Stanley-Cadogan Company  
**MARYLAND**  
Baltimore — Henry H. Meyer Co., Inc.  
**MASSACHUSETTS**  
Boston — The Equipment Company  
New Haven, Conn. — W. I. Clark Co.  
**MICHIGAN**  
Detroit — Wm. F. Favre Company  
Grand Rapids — Contractors Mach. Co.  
Iron Mountain — Service & Supply  
Division of Lakeshore Engineering Co.

**MINNESOTA**  
Pulaski — Burdick  
St. Paul — Burdick  
**MISSISSIPPI**  
Amory — Dairy  
New Orleans, La. — States Equip.  
**MISSOURI**  
Kansas City — O. B. Avery  
St. Louis — O. B. Avery  
**MONTANA**  
Billings — Wm. F. Favre  
**NEBRASKA**  
Omaha — Anderson  
**NEVADA**  
Los Angeles, Cal. — States Equip.  
San Francisco, Cal. — States Equip.



dirt-moving in the vicinity.

#### Personnel

The General Superintendent for B. Perini & Sons, Inc., was John L. Doherty, with Superintendents Al Lattanzi and Louis Capone in charge on the job, and Len Williamson in charge of equipment maintenance. Hugh Doherty was Office Manager, with William B. Allen as Perini's Engineer. F. W. Smith is Project Manager for Corbetta-Walsh, and Commander D. E. Rockwell (CEC) USNR, is Officer-in-Charge of Construction for the Bureau of Yards and Docks, U. S. Navy.

Let's Finish the Job! Buy More Bonds!

#### Shunk Mfg. Co. Names Field Service Engineer

J. R. (Jack) Randle has been appointed to the position of Field Service Engineer by the Shunk Mfg. Co., Bucyrus, Ohio, maker of grader and snow-plow blades for construction and maintenance equipment, which is now celebrating its 90th anniversary. Mr. Randle will be engaged in devising and organizing new distribution methods, and developing new uses for the company's manufacturing facilities. His experience in the field includes 28 years with the Ingersoll-Rand Co., where he served as Field Engineer, and he has also been

connected with the Illinois Powder Mfg. Co. and the Cleveland Rock Drill Co. in a similar capacity.

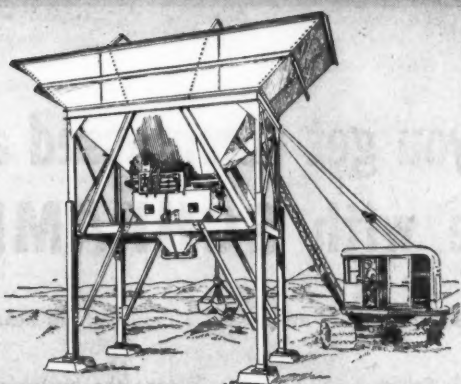
#### New President Named For Atwell Corporation

George J. Atwell, Jr., has been named President of the George J. Atwell Foundation Corp., contracting firm specializing in excavations, pile and caisson foundations, underpinning, shoring, concrete work and paving, as well as sub-surface structures, such as sewers, electrical, steam, gas and water lines, and gas and oil storage. Mr. Atwell was formerly Vice President of the company.

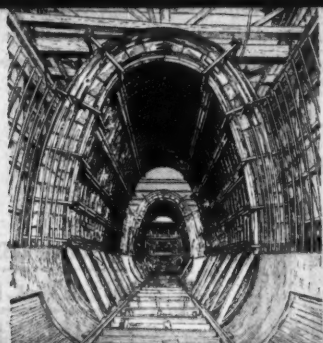
#### Diesel Engines Work On the Home Front

We have been so completely filled with news, photos, and stories on the work of engines and equipment on the fighting fronts that it is interesting now to find a booklet devoted to the service of diesel engines on the home front. Caterpillar Tractor Co., Peoria, Ill., has published an illustrated 32-page booklet, Form 8657, which shows many applications at airports, on boats, for service stations, repair shops, sawmills, for pumping and drilling operations, etc. Copies may be secured on request by mentioning this review.

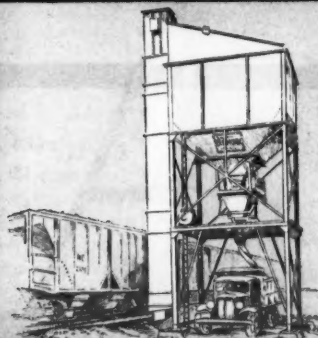
# FASTER CONSTRUCTION



AGGREGATE BATCHING PLANTS



STEEL FORMS  
FOR GENERAL CONCRETE CONSTRUCTION



BULK CEMENT PLANTS

**T**hat unbeatable combination of correct design, rugged construction and assured performance has made Blaw-Knox equipment first choice of construction men who have a reputation for getting things done in a hurry...You'll find this trouble-free equipment hard at work building roads, airports and general concrete construction all over the world.

You can depend on your nearest Blaw-Knox Distributor to handle your inquiry promptly and efficiently.

# BLAW-KNOX

#### BLAW-KNOX DIVISION OF BLAW-KNOX COMPANY

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**NEW HAMPSHIRE**  
Barre, Vt. — Casolin-Venable Corp.  
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**NEW JERSEY**  
New York, N. Y. — R. E. Brooks Company  
Philadelphia, Pa. — Giles & Ransome

**NEW MEXICO**  
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**NEW YORK**  
Albany — Leikin Equipment Co.  
Buffalo — Tractor Corporation  
Elmira — LeVallier, McLeod & Kinkaid  
Endicott — Hering Motors Co., Inc.  
New York — R. E. Brooks Company  
Rochester — Keystone Builders Supply  
Syracuse — Syracuse Lumber Co.  
Utica — McQuade & Bannigan, Inc.

**NORTH CAROLINA**  
Raleigh — Carolina Tractor & Equip. Co.  
Salisbury — Carolina Tractor & Equip. Co.

**NORTH DAKOTA**  
Fargo — Dakota Tractor & Equipment Co.

**OHIO**  
Cleveland — H. B. Fuller Equipment Co.  
Columbus — W. W. Williams Co.

**OKLAHOMA**  
Tulsa — Leland Equipment Co.

**OREGON**  
Portland — Contractors Equipment Corp.

**PENNSYLVANIA**  
Philadelphia — Giles & Ransome  
Pittsburgh — Dravo-Doyle Company

**RHODE ISLAND**  
Providence — The Equipment Co.

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**TEXAS**  
Dallas — Conley-Lott-Nichols Mach. Co.  
Houston — R. E. Everett & Co.

**UTAH**  
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**VERMONT**  
Barre — Casolin-Venable Corp.

**VIRGINIA**  
Richmond — Rich Equipment Co.  
Roanoke — Rich Equipment Co.

**WASHINGTON**  
Seattle — Star Machinery Co.  
Spokane — Empire Equipment Company

**WEST VIRGINIA**  
Charleston — Rich Equipment Co.  
Clarksburg — Rich Equipment Co.

**WISCONSIN**  
Milwaukee — Hunter Tractor & Mach. Co.

**WYOMING**  
Billings, Mont. — Western Coast Equip. Co.  
Denver, Colo. — Ray Corson Mach. Co.

**ALASKA**  
Seattle, Wash. — Northern Commercial Co.

**CANADA**  
Montreal — Watson Jack & Co., Ltd.  
Toronto — W. L. Ballentine Co.

**BRITISH COLUMBIA**  
Vancouver, B. C. — R. C. Begg Co., Ltd.  
Winnipeg — Kane Tractor & Equip. Co.

**NEW FOUNDLAND**  
St. John's — Dominion Distributors Co.



# Old Boston Armory Now a Repair Shop

**State Public Works Dept.  
Maintains Road Equipment  
In Odd Temporary Quarters  
Until War Is Over**

† IN December, 1943, when the Army took over the Commonwealth of Massachusetts Department of Public Works' shop at 400 D Street, South Boston, the Governor gave the DPW, in exchange, shop space in the old horse ring in the Commonwealth Armory on Commonwealth Avenue and Gaffney Street, opposite the Boston Braves baseball park. Directly behind and attached to the main drill shed of this State Guard Armory is a 275-foot-long x 104-foot-wide red-brick section, where the guardsmen formerly rode their horses. This large shed now hums with the noise of shop machinery busy repairing anything from a pneumatic tool to a 10-ton roller. The State owns over 2,000 pieces of equipment, not counting autos and trucks, of which not more than fifteen are of one kind, so it is imperative that a flexible and versatile shop and personnel be maintained to keep highway equipment in perfect running order.

These repair jobs come in from all over the state. Any piece of equipment that is less than 10 miles away from this shop at 25 Gaffney Street may be towed in for repairs. Beyond that distance, equipment is moved by semi-trailers. For this purpose the Department uses a Sterling truck tractor equipped with a 40,000-pound winch, and an Autocar truck tractor with a 1-ton crane. In conjunction with these are six trailers: one 40-ton and one 20-ton low-bed type, and four 20-ton high-bed trailers.

On arriving at the shop, the equipment to be repaired is first given a thorough cleaning. This operation must be done on a side street outside the shop, for the Armory has no floor drains. A portable Kerrick Kleaner, mounted on rubber tires, working at 100-pounds pressure, thoroughly steam-cleans the equipment, while the dirt and water run off into a storm sewer in the gutter. This cleaner has a kerosene burner to aid in dissolving the soap, and is operated simply by plugging into an electric outlet and water-pipe connection. After washing, the parts are dried by blowing off the remaining water with air pressure from an air outlet.

Now the equipment may enter the shop through a 12 x 12-foot sliding wooden door located in the center of the west wall. Two similar doors on the south and east sides provide exit. This main shop has 26,000 square feet of floor space with a vertical clearance of 20 feet to the nearest roof beam, and a 40-foot height at the center to the pitch of the roof. The roof is wooden with a gravel topping, and good natural light is provided by four large skylights opening for side ventilation. Twenty-eight lights, each with a 750-watt bulb, furnish additional illumination when needed. High wall radiators and four centrally spaced unit heaters can maintain a 65-degree temperature on cold winter days. The Armory formerly had only a dirt floor, but it is now paved with an 8-inch crushed-stone foundation course topped by 2 inches of penetration macadam. This results in a resilient wearing surface easy on the feet, but it readily disintegrates if gasoline or oil is permitted to remain and cut through the asphalt. A white powder, Asbestosorb or Speed-Dri, which absorbs the oil, is scattered on these patches and swept off the next day. This powder may be used over and over until too dark for further use.

## Checking System

Before any repairs are started, the

equipment is checked by a tester, who has a compact closed-in office immediately at the right of the entrance. He inspects and tests the equipment, and makes out a job ticket to cover the repairs. In his files he has a 10 x 12-inch envelope for each piece of equipment in the state. On the outside of the envelope in 1/2-inch bold black type is the following information:

Make  
Purchased from  
Date purchased  
Cost  
Maker's No.  
Serial No.  
Model No.  
Remarks

These envelopes are filed according to Department registration equipment numbers, which are keyed to show from which of the state's seven districts the equipment comes. Any piece of equip-

ment that costs \$25 or more is clearly marked with such an identifying number. These numbers also are keyed to show the type of equipment, such as trucks, plows, etc. In the envelope is kept a complete record of every repair that has been made to that machine. With such a case history available, the repairs necessary can almost be foretold.

Parts from stock are charged against equipment numbers and are duly entered

on the record sheets. On these sheets is indicated every possible type of repair with a corresponding item number. When and by what mechanic the work is done are also noted. When repairs are made in the field, as is often the case with snow-removal equipment, complete information is entered on a yellow form which must be sent to the Gaffney Street shop where it becomes a part of the

(Continued on page 68)

## MONDIE DROP and UPSET FORGINGS FOR CONSTRUCTION EQUIPMENT

Such as Dipper Teeth, Trencher Teeth, Gear Blanks, Levers, Tie Rods, Cranks, Crank Shafts, Special Shapes, etc. Forging weight range from 1 to 50 pounds.

Inquiries given prompt attention by our Engineering Dept.

**MONDIE FORGE COMPANY INC.**  
10299 Berea Road  
Cleveland 2, Ohio

## Yes...you get compressed air anywhere with SCHRAMM

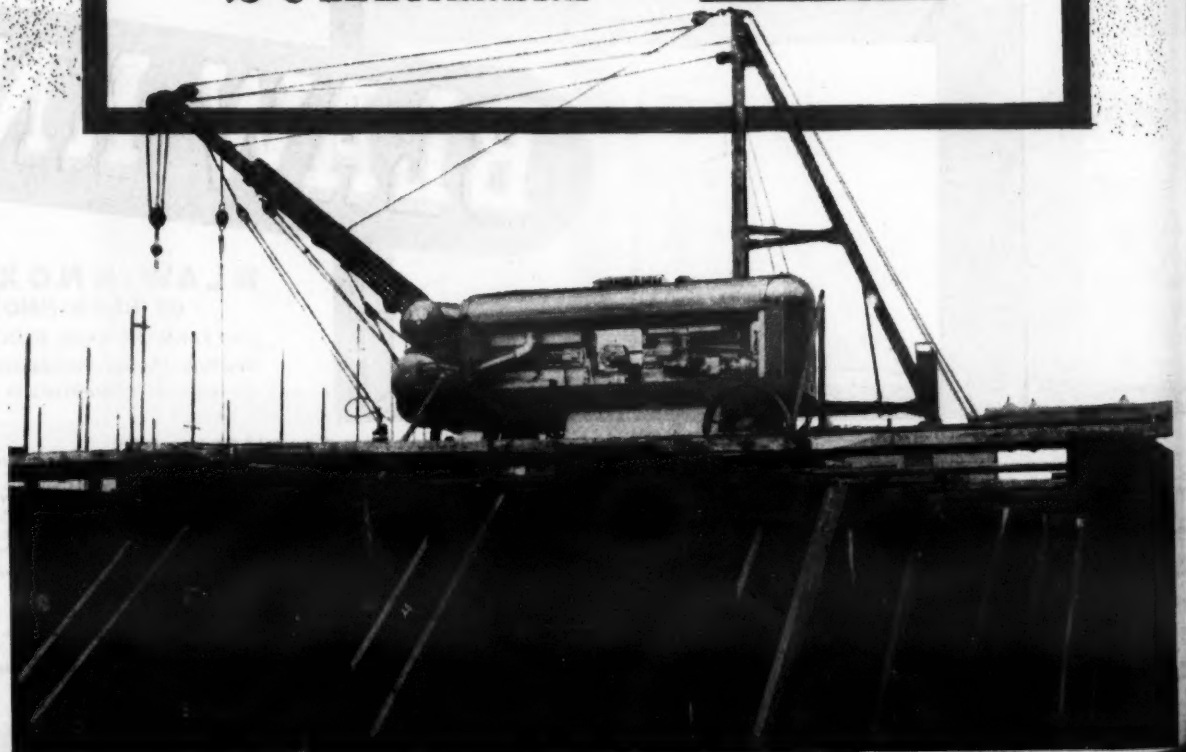
Far out on a pier construction job in the ocean... you find this Schramm Air Compressor.

That's the beauty of a Schramm. You're able to take the portable unit anywhere—because they are lightweight, compact, easy to tow about.

You get all the air you want. Never-failing service results from: 100% water cooled to prevent overheating and freezing... mechanical intake valve operating from cam in perfect timing... larger discharge valve with lower lift adding to efficiency... electric push button starter... forced feed lubrication... multi-cylinders and lighter parts

Simplify your construction job by using Schramm Compressors. Write today for Bulletin SE-44.

**SCHRAMM INC.** THE COMPRESSOR PEOPLE  
WEST CHESTER  
PENNSYLVANIA





# Winter Maintenance For Michigan Roads

(Continued from page 21)

surfaces, if the hard-packed snow cannot be removed by blades or graders. While the Highway Department tries to maintain year-round bare road surfaces, hard-packed snow cannot always be removed at low cost. On secondary roads or low-traffic trunk lines in the northern Lower Peninsula and in the Upper Peninsula, the following procedure is permissible:

The snow surface is bladed smooth with conventional curved blades to remove ruts and other irregularities. This smoothed surface is immediately scored with serrated blades. Straight-line blading operation during the scoring is mandatory as motor vehicles have a tendency to follow the serrations. These steps are sometimes enough but, if not, chemically treated abrasives are applied at a rate sufficient to control skidding.

With such a program of snow and ice control, the Michigan State Highway Department is prepared for anything the elements may offer. But they do hope they will not have a winter like that of 1942-43 when 20 feet of snow fell on the Upper Peninsula, and when even sections in the western half of the Lower Peninsula along Lake Michigan had a total snowfall of 10 feet.

## Personnel

Charles M. Ziegler is Michigan State Highway Commissioner. Harry T. Ward is Chief Deputy, Harry C. Coons is Deputy Commissioner and Chief Engineer, and Burleigh R. Downey is Maintenance Engineer.

## A New and "Tricky" Polarized Road Sign

Predicated on the idea that we shall have polarized headlight beams as standard or at least optional equipment on our post-war automobiles, the Polaroid Corp., 718 Main St., Cambridge 39, Mass., has recently patented a method for making light-polarizing traffic signs that are visible to night-driving motorists only when they are using the wrong headlights. The traffic signs are designed for automobiles fitted with both a polarizing headlight system for country driving and an ordinary headlight system for city driving.

The novel warning, "Shift to polarized beam" and "Shift to unpolarized beam" would be visible to the driver when he uses the wrong headlight system for the area in which he is driving. However, the warnings would be invisible when he uses the right system.

## Personnel Transfers

### At Lincoln Electric Co.

W. R. Persons, District Manager at Pittsburgh since 1937, has been transferred by the Lincoln Electric Co., manufacturer of electric arc welding equipment, to carry out a special war-plan-

ning assignment in the company's main office at Cleveland, Ohio.

J. S. Roscoe succeeds to the management of the Pittsburgh office. His association with the company dates from 1924, and he has been serving as District Manager at Syracuse up to the time of his present appointment.

## Carver Sales Appointments

John J. O'Leary has been named representative in the central states for the Carver Pump Co., Muscatine, Iowa, with a branch office at 201 N. Wells St., Chicago, Ill. Previously he was connected with the Independent Pneumatic Tool

Co., Chicago, in a similar capacity.

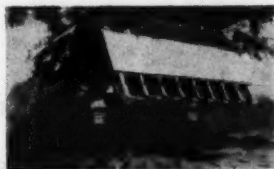
The Carver Pump Co. also announces three new distributors: Acme Contractors Machinery & Equipment Co., Inc., 4221 W. Harrison St., Chicago, Ill.; the H. B. Faith Equipment Co., 2601 Huffman Blvd., Rockford, Ill.; and the Central Supply Co., Danville, Ky.

# Isaacson KLEARING BLADES

## Do it better

First developed for the U. S. Forest Service for making logged-off stump land usable, Klearing Blade has been so successful in removing trees, brush, stumps, roots and rock that it has revolutionized land clearing throughout the Pacific Northwest. Costs have been cut 50% to 75%. No doubt you too have read how it combs out roots and other material to a depth of 21" below the top of the ground, leaving the valuable top soil intact ready for plowing. Patented teeth are adjustable to three positions and especially shaped for maximum penetration and lifting power. Klearing Blade is ideal for clearing right-of-way, stump land, airports, handling hard-pan or rock jobs. Piles stumps, brush, and roots dirt free, for easy burning. Now it is again available and can be obtained for your Isaacson Trac-Dozer.

Put it on in place of the ordinary blade in a few minutes.



Clear land at a surprisingly low cost and increase your tractor income.

Available for cable or hydraulic operation. See your dealer today or write for descriptive literature.

**ISAACSON**  
SEATTLE  
ENGINEERED TRACTOR EQUIPMENT



EXPERIENCE builds you PERFORMANCE sells you

SAFE from Invasion is no idle boast today. The enemy has been driven from the Alaskan outposts and they dare not attack us here! ROGERS TRAILERS have played a big part in fortifying our coastlines and they are fighting with our men overseas!

## on ROGERS TRAILERS

The ROGERS TRAILERS which will be available to industry when present war contracts are completed, will be even better-engineered and more efficient than the thousands which have been operated so successfully for many years.

ROGERS BROS. CORPORATION  
ALBION, PENNA.





## Emergency Measures For Erosion Control

(Continued from page 34)

The above applies to extreme conditions, but for the ordinary run of roadside erosion, extensive programs of seeding or sodding must be curtailed, and as a substitute the practice of mulching can be stressed. Mulching alone, without any topsoiling, fertilizing, or seeding, is of great value in checking erosion on slopes. Seeding can be done at some later date through the mulch.

Roadside cuttings, wild grasses, non-noxious weeds, and even briars and first-year growth of woody plants can be used very successfully as mulch in place of the straw and hay which have become so costly and scarce. There seems to be no logical agricultural objection to the use of roadside cuttings as mulch in extensive wooded areas, and even where the highway runs through crop land, little serious opposition has been advanced provided cuttings containing noxious weeds are not used.

If cutting is done after roadside grasses and weeds have matured, the seed contained in the mulch will provide a seeding without cost, to supplement the value of the mulch itself. Soft green early-season cuttings are not as good as mature growth, but it must be remembered that any mulch is better than no mulch at all.

Even though labor and equipment are not available for extensive topsoiling, the use of a very thin sprinkling of good topsoil in connection with mulching is very beneficial. Topsoil that is to be used in this way should have a large amount of humus, grass roots, and seeds since it is these things rather than the depth of topsoil that are of value in getting vegetation started. As one field superintendent describes it, it is merely a "coloring" of the slope with a small amount of soil obtained from the top of the slopes.

Under present conditions, a labor shortage may prevent the extensive collection and use of roadside cuttings as mulch, and in most instances equipment is not available for hauling mulch, but use of cuttings on slopes immediately adjacent to where they were cut will be a big help in controlling erosion, even if it is not the ideal solution to the problem.

Reseeding of small areas of failures in vegetative cover has been curtailed greatly, but here again the use of mulch immediately on bare or weak spots will save more serious failures later.

Fertilizing of existing vegetative cover has generally been curtailed, but wherever possible the turf on shoulders and in roadside gutters should be fertilized to maintain thick vigorous cover. Al-



Public Roads Administration Photo

Wartime mowing on a Maryland highway. Note the single swath mowed above the gutter on the right. The upper slopes are permitted to revert to native perennials and vine ground cover.

though some grades of mixed fertilizers have been discontinued and there is a scarcity of some fertilizer materials, the restrictions on nitrogen have been relaxed. With nitrogen available again, and with a little extra effort in determin-

ing the best possible fertilizing program according to the needs of the soil, the type of turf, and the fertilizer materials that are available, a necessary minimum of fertilizing of at least shoulder and gutter turf may be possible under a

reduced budget.

Old established turf shoulders that have "built up" enough to prevent proper drainage present a maintenance problem when equipment and labor are not available for proper reworking without destroying the turf. As a temporary corrective measure, relatively wide outlets can be cut through the shoulder turf at low points in the grade. These outlets can be protected with sod salvaged from the shoulder or by an inexpensive bituminous paving. Admittedly a makeshift operation, it is decidedly better in most locations than machine blading of the shoulder which leaves it bare and subject to serious erosion because of inability to save topsoil and turf or reestablish turf cover by reseeding.

### Mowing

Mowing is an item of roadside maintenance which can be reduced considerably both in width and frequency.

It is essential, however, to mow turf shoulders and roadside gutters frequently. (Continued on next page)

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## Wartime Curtailment Of Roadside Mowing

(Continued from preceding page)

quently enough to: (1) prevent deterioration of the turf and subsequent recurrence of erosion; (2) prevent traffic hazards due to high grass and weeds; (3) prevent interference with drainage; and (4) reduce the risk of roadside fires, particularly in wooded areas.

If mowing is not done frequently enough on these areas, the turf plants will become spindly and weak, and weeds will take hold and crowd out the turf plants. This is particularly true in southern states where Bermuda grass, which will not stand overshadowing by taller grasses and weeds, is a principal safeguard against erosion.

Tall grass and weeds on shoulders cause pedestrians to walk on the pavement edge, and also cause an unconscious tendency on the part of the motor-vehicle operator to shy away from the shoulder and travel too close to the center of the pavement.

Tall grass and weeds in roadside gutters interfere with the free movement of water in these channels, and cause deposition of silt that will not occur if a low close turf is maintained.

The risk of fires, particularly forest fires, starting from matches, cigarettes, etc., thrown onto the roadside is probably overemphasized, but if roadside areas between gutter lines are kept mowed and thus kept free from tall dry grass, the fire hazard is reduced to a negligible amount.

On narrow roadway cross sections the shoulder and gutter areas should be mowed regularly, or at least to the flow line of the gutter if it is not possible to mow the entire gutter section. On fills, one swath outside of the edge of the shoulder is advisable. On wide cross sections, mowing should be done regularly for a width of one swath outside of the shoulder edge on both cuts and fills.

The number of mowings per season depends upon the length of the growing season and the type of turf. For economy reasons a maximum of four mowings is suggested, and an absolute minimum under any conditions would be twice during the season. One mowing of shoulders in the late autumn after the end of the growing season will be helpful in the removal of snow from the pavement and shoulders.

Other than the shoulder and gutter areas just discussed, the mowing of the remainder of rights-of-way through cultivated land or other open country can be reduced to one mowing per year for the purpose of preventing the spread of weeds, particularly noxious weeds, to crop land, and in the snow belt to prevent drifting of snow that will be caused by tall grass and weeds.

All mowing outside of shoulder and gutter areas can be eliminated in wooded areas, and even in cultivated areas. The once-a-year mowing suggested previously need not be done if there is not a weed or snow problem. Although not an ideal situation, the deterioration of turf due to lack of mowing is somewhat offset by the matting down of tall growth to form a protecting mulch, and by nat-



Public Roads Administration Photos

Breakage and the resulting need for replacement parts on mowers operating on rough narrow shoulders have been a serious wartime problem. Wider shoulders and a fence line set outside the drainage area may be one result of this wartime experience. In contrast, at right, a well-rounded cross section in Florida, without ditches or guard rails to retard machine mowing.

ural reseeding from the mature grass growth.

Mention should be made here of the fallacy of extremely close mowing of

shoulders, median strips and intersections. This "shaving" of the turf is detrimental either in peace or war, but, in addition, close mowing causes far more

wear and tear on equipment due to hitting small sticks, stones, or other debris that a mower cutting approximately 3 inches high would miss. Similarly the mowing of shoulders and median strips by the calendar every two or every three weeks, for example, instead of mowing according to weather conditions, and the condition of the turf, might also have serious effects on the life and vigor of the turf. It could happen that the reduced mowing of wartime would be a boon to the turf on some highway shoulders.

### Right-of-Way Clean-Up

The term "right-of-way clean-up" as used here refers to the cutting by hand of heavy weeds, briars, and young tree growth on the outer portion of the right-of-way, and also to the cutting of lighter grass and weeds in areas inaccessible to mowing machinery. This work is variously known as right-of-way cutting, shrubbing, bushing, brushing, or brambbling.

(Concluded on page 81)

Gar Wood Industries, Inc., manufactures Truck and Trailer Equipment including Hydraulic and Mechanical Hoists, Dump Bodies, Tanks, Flushers, Sprinklers, Winches, Cranes, Pole Derricks, Power Take-Offs; also Road Machinery including 2 and 4 Wheel Hydraulic Scrapers, 4 Wheel Cable Scrapers, Hydraulic and Cable Dozers and Trailbuilders, Hydraulic and Cable Rippers and Tamping Rollers; also Heating Equipment and Motor Boats.

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# Patching Texas Roads Prior to Improvement

## Seal-Coat Application by Contract Is Preceded by Patching and Edge Sealing Done by State Forces

IN the Amarillo District of the Texas Highway Department, located in the panhandle of Texas, an extensive program of maintenance and betterment by contract was undertaken in the spring of 1944, to repair the heavy damage done to bituminous roads in the district by the heavy and prolonged snow conditions occurring during the unusually severe winter of 1943-44. Prior to the award of these contracts, the maintenance department performed patching and edge-sealing preliminaries on the 490 miles of road in the district to be improved under contract in 1944, 370 miles by sealing and 120 miles by the application of a blanket coat of hot-mix.

Since Texas is a southern state ordinarily having little snow even in the northern panhandle, the past winter severely taxed its facilities, both men and equipment, for snow removal, and the snow damage was aggravated by the intermittent warm days, on most of which considerable thawing occurred. With much of the drainage inadequate because the amount and type of snow-removal equipment available did not allow complete removal of snow from shoulders and ditches, this melting snow severely damaged the bituminous roads, some of which had been completed or resealed late in the autumn and had not received the benefits of hot-weather traffic.

Maintenance is not easy in the Texas panhandle, with its elevation of 2,600 to 4,500 feet, its annual air-temperature range of 0 to 110 degrees, and 19 inches of annual rainfall, but the 370 miles of resealing by contract in 1944 was approximately twice the mileage usually necessary, and taxed the aggregate-producing facilities of the locality.

### Patching with Pre-Mix

Patching of holes as they develop in bituminous surfaces is conducted constantly in this district, since it is more economical to patch these holes in their

incipient stages than wait until they become extensive. However, additional speed in this operation was necessitated last spring in order to have the entire mileage planned for contract improvement in 1944 patched ahead of the contractors' operations.

Gravel aggregates with a maximum size of  $\frac{1}{2}$  inch and with 60 per cent retained on a No. 20 sieve are bought on competitive bids from local producing agencies, unloaded by contract and distributed to strategic points throughout the district. The average patching crew, consisting of a foreman, two truck drivers, two flagmen, two men operating and charging the mixer, and four men patching and raking, moves one of the small Blystone bituminous mixers belonging to the district to one of these

stockpiles.

There, approximately 6 per cent of RC-2 is mixed with the aggregates. Asphalt for mixing is heated in 300-gallon Littleford, Chausse, Mohawk or other asphalt heaters and transferred by hand to the mixer, the heater being recharged from drums of asphalt carried on the truck. Aggregates are fed to the mixer by hand and the mixed material loaded into dump trucks, on which the load is now restricted to 2 cubic yards because of tire conditions.

Material hauled to the road is placed in the cleaned-out holes, raked by hand, and rolled by wheel trailer rollers weighing from 2 to 5 tons. The patches are made approximately 2 inches thick, usually replacing the existing 1-inch top and a small amount of the disintegrated caliche base. Not only because of the man-power shortage, but because it has been found to work equally well, holes to be patched are not always cut with a vertical edge but the patching material is permitted to feather out onto the unbroken surface.

In conjunction with the patching operations preliminary to contract resealing, all cracks which do not require patching are sprayed with hot asphalt, using a spray nozzle from a South Bend bituminous distributor. In this operation ordinarily 2,000 to 3,000 gallons of asphalt are applied in a 12-hour day.

### Edge Sealing

On a considerable mileage of the work on which contract resealing operations are to be performed, the outer edges of the surface course have suffered some disintegration, and a different procedure is used to improve this condition. For this work two different classes of seal-coat aggregates are used, the first type, known as 303-A, having the following gradation:

Retained on  $\frac{1}{8}$ -inch screen  
Retained on  $\frac{3}{8}$ -inch screen  
Retained on No. 10 screen

Per Cent  
0  
0-10  
95-100

This type of aggregate is used where the crown in the existing road is sufficient so that a slightly built-up edge will  
(Concluded on page 62)

## DITCH DIGGING



ON EVERY fighting front, U. S. Engineers use this versatile Barber-Greene Ditcher to speed the digging of drainage ditches, sanitary and waterlines, foundations, etc. Under average conditions, the Ditcher attains a digging speed of  $2\frac{1}{2}$  feet per minute—a stiff pace that can be maintained only with the help of effective lubrication.

On every construction job, equipment maintains the pace easier when effectively lubricated. And to more and more contractors today, effective lubrication means—Texaco.

Texaco Marfak, for example, used in your tractors, shovels, bulldozers, trucks, etc., provides ideal film lubrication inside a bearing, yet maintains its original

consistency at the outer edges... sealing itself in, sealing out sand, dirt, water. Its tough adhesive film cushions bearings against road shocks. Makes parts last longer.

For wheel bearings, use Texaco Marfak Heavy Duty. It stays in the bearings—off the brakes. Seasonal repacking is no longer required.

Texaco lubricants have proved so effective in service that they are definitely preferred in many fields, a few of which are listed at the right.

Texaco Lubrication Engineering Service is available to you through more than 2300 Texaco distributing points in the 48 States. The Texas Company, 135 East 42nd Street, New York 17, N. Y.

### THEY PREFER TEXACO

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

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### Multiple Disc Clutches For Various Services

There are many uses of multiple disc clutches, such as main drive clutches, as auxiliary clutches controlling individual units, and in power take-off mechanisms. Pullmore multiple disc clutches made by the Rockford Drilling Machine Division of Borg-Warner Corp., Rockford, Ill., are available in single and double types, for operation in oil or dry, in many capacities ranging from 1 to 90 hp at 500 rpm and with a generous safety factor. They are reported to work reliably at all practical speeds and handle effec-

tively loads much greater than their rated capacity. Double Pullmores may be applied to obtain forward and reverse movements or high and low speeds, or used as clutch and brake.

Bulletin 4 PC describes and illustrates these clutches and their numerous applications. Copies of this bulletin will be sent by the manufacturer promptly on request to those mentioning this item.

### Tractor-Mounted Shovels

An illustrated bulletin on the 1944 Lessman tractor shovel describes the new features and specifications of these units,

which are available in a number of different heights, weights, and shovel capacities. One of the features of the Lessman tractor shovel is that it is sold as a unit, with the Lessman shovel already mounted on the particular model of an Oliver industrial tractor for which it was designed. Other features include the over-throw-type bucket, extension reach, special heavy arms, automatic shovel return, equalizing cable method, synchronized clutch and brake, and special steering mechanism.

Copies of this Circular No. 44, containing further information on these mobile, easily maneuverable yet sturdy

shovel units may be secured by those interested direct from the Lessman Mfg. Co., 20th & Easton Blvd., Des Moines 4, Iowa. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

### Sewer Pipe Assn. Moves

The Clay Sewer Pipe Association, Inc., has announced the removal of its offices from Pittsburgh, Pa., to Room 1902, A.I.U. Bldg., 50 West Broad St., Columbus, Ohio. The administrative and field personnel will remain the same, headed by H. C. Maurer, President, and Benjamin Eisner, Chief Engineer.

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Mine Ventilation. Bellows run by Manpower. Fanblowers operated by Treadmill.

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Service is  
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**Lack of adequate power was the main obstacle of men with inventive minds, in the early days of our history. Today—you can have the finest most efficient, economical power ever developed, by specifying BUDA Diesels.**

Write for bulletin

**BUDA**



## N. H. Access Roads To Mines and Timber

(Continued from page 11)

### Roads Help Mica Production

The completed roads are, necessarily, no smooth riding parkways, but they serve their purpose if men, equipment and materials can be moved up and down the mountains despite climatic conditions. Many man-hours of production are saved by getting workmen to and from the mines in a short space of time. Despite heavy snows, these roads can be kept open in winter by tractors with V-plows or, what is more common, by a truck equipped with a blade plow.

Interestingly enough, more stabilization of the road is needed in summer than in winter. In winter a road that is merely graded will freeze to an iron-like consistency and can be used as long as it is plowed clear of snow. Summer turns the rich forest loam into boggy morasses which must be well covered with gravel to provide adequate bearing surfaces.

Under construction during the summer of 1944 were 16.5 miles of gravel roads which service seventeen mica mines, or a mine a mile. The longest road, 4.2 miles, accommodates four mines, while the shortest road is 0.2 mile. The cost of these roads averages \$5,000 per mile.

### A 4.2-Mile Mica-Mine Road

A typical mica-mine access road 4.2 miles long was built in the town of Grafton, N. H., by David Nassif Co., a Boston, Mass., contracting firm which

has had similar experience in this type of road construction on the Alaska Highway. This new gravel road serves four mines, De Mott, Buckley, United, and Carpenter. Heavy timber was cut by a 2-foot pneumatic chain saw powered by a Sullivan 110-foot compressor. Clearing and grubbing was done by a Caterpillar RD8 and a Cletrac DD tractor with bulldozers. A 3/4-yard Lorain gas shovel handled the cuts; and earth was hauled out by twelve International trucks of 3-yard capacity which also hauled in the gravel from a borrow pit in town. An Austin-Western diesel-powered grader shaped up the subgrade and also spread the gravel when dumped by the trucks.

Clinton W. ("Red") Hatt, Superintendent for the contractor, attests that the New Hampshire terrain is comparable to conditions met in Alaska Highway construction. O. D. Lindsay was Resident Engineer for the New Hampshire State Highway Department on this project.

The major quantities on this \$26,975 contract were:

Item	Quantity
Clearing and grubbing	4.9 acres
Excavation, unclassified	16,000 cu. yds.
Gravel, overhaul	4,050 cu. yds.
Gravel borrow, base course	8,100 cu. yds.
Plain concrete pipe, 15-inch	760 lin. ft.

This access road ties into a 14-foot town road which connects with the state highway system.

### Timber-Area Access Roads

Also under construction this year were 35.5 miles of access roads to five timber areas, all located in Coos County in the northeastern corner of New Hampshire at elevations of 1,800 to 2,000 feet. These roads are 3 to 15 miles long. 12 feet wide, but have a heavier



Public Roads Administration Photo

A typical mica-mine access road in New Hampshire.

surfacing than the roads to the mica mines. Because of the greater loads carried, the timber roads are topped with gravel from 1 to 2 feet thick.

Requests for timber-area roads are submitted to the Public Roads Administration, accompanied by a map showing the area to be served. If the need for such access roads is recognized, the

State Highway Department proceeds to accept bids for such construction. In some instances where lumber or paper companies had the facilities for building their own roads they did so under the supervision of a Highway Department resident engineer, and were repaid what they spent on a force-account basis.

(Concluded on next page)

Those Good  
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STEEL  
Renewable  
TRACTOR  
RIMS

Are Again Available,  
and they are just  
as tough and long-  
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You can pump more water at less cost per gallon with a Carver Pump because it stays on the job longer at top performance. Trouble-proof design, lifetime, tungsten carbide seal, special, long-life impeller and removable liner mean less time out for repairs and maintenance. The recirculation tube is scientifically designed to provide fastest priming, peak efficiency, and correct amount of recirculation to keep priming chamber free from clogging deposits of silt, sand or dirt.

If your job entails unusual pumping conditions we will gladly submit specific performance estimates. The performance of every Carver Pump is carefully checked in our testing laboratory to make sure that it meets our high standards for performance on the job. The "Certified" tag is your assurance of peak performance for your toughest jobs. For details, see your nearby Carver distributor or write direct.

**THE CARVER PUMP CO.**  
Muscatine, Iowa

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## New Hampshire Builds Roads for War Effort

(Continued from preceding page)

Thus the St. Regis Paper Co., which owns a timber area near Pittsburg, N. H., built an access road by doing its own clearing, grubbing, and drainage and was afterwards reimbursed by the State. Excavation and gravel placing were done under a contract. A 3.5-mile road is being built through the towns of Randolph and Jefferson by the Brown Lumber Co. Another road, 6.5 miles long through the towns of Dummer and Millsfield, is being built on an actual cost basis by the Paris Mfg. Co. The remaining roads are being built by contractors.

Access-road construction has helped lumber companies which could not build roads of their own to operate the year round in an industry which formerly had been of a seasonal nature. V-plows on tractors kept these roads cleared of snow so that last winter one company at Indian Stream took out 3,000,000 board feet of hardwood logs. Other concerns now haul pulpwood on a year-round basis from previously inaccessible forest lands.

### Timber Bridges

Many drainage structures on these roads, ranging from 2 x 3-foot culverts to bridges 224 feet long, are built of logs. On the Dartmouth College Grant in Coos County, given to the college by a King of England, a \$4,375 timber bridge was built by Sawyer & Swett, contractor of Winchester, Maine. This bridge crosses the Dead Diamond River 15 feet above the stream bed and is part of a long access road to the Washburn Lumber Co.'s timber area.

The bridge has six 28-foot clear spans supported on five piers and two abutments made of log cribs weighted with one-man stone. The voids are filled with smaller rocks. The piers and abutments are 14 feet long, 8 feet wide, and 12 feet high, made from 10 and 12-inch logs. Stringers are 16-inch logs, 32 feet long, on top of which is laid a 3-inch plank deck. A 10-foot clear roadway is thus afforded, protected by a felly guard of 6-inch logs. The bridge is tied together by 8-inch spikes and 3/4-inch round drift pins.

The major quantities involved on this bridge contract were:

Item	Amount
Excavation, unclassified	210 cu. yds.
Structural timber, 3-inch plank	7.63 MBM
Structural timber, logs	39.00 MBM
Rock fill	366 cu. yds.
Drift pins, 3/4-inch round	3,400 lbs.
Spikes, 8-inch	900 lbs.

### Personnel

John Morton, Construction Engineer of the New Hampshire State Highway Department, is in charge of the construction of both mica-mine and timber-area access roads, under the supervision of Frederic E. Everett, State Commissioner of Highways. Paul S. Otis is the Highway Department's Soil Engineer. H. Q. Thomas is Senior Highway Engineer at Concord, N. H., for the Public Roads Administration.

### Portable Generators Both Gas and Electric

The Army Corps of Engineers has developed for military use two portable gas-generating units as well as an electric generator mounted in a jeep to meet its varied needs for welding and cutting equipment. The electric welding generator is a 200-ampere 30-volt unit mounted in a 1/4-ton 4 x 4 truck.

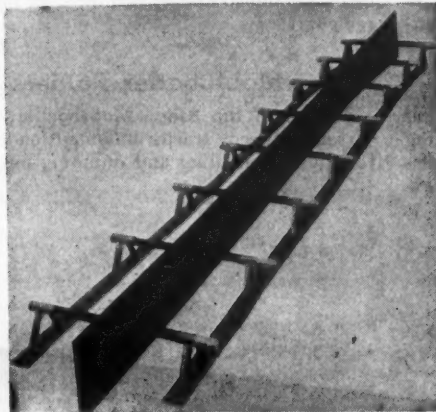
The first of the gas-generating plants is for oxygen-nitrogen and is capable of producing 500 cubic feet of oxygen or nitrogen and of pumping these gases into cylinders at 2,000 psi. It is mounted

on a semi-trailer and the total weight of the plant and semi-trailer is approximately 40,000 pounds. The oxygen produced by this plant is of commercial purity, about 99.5 per cent, and is suitable for both welding and medical purposes. The plant uses air as raw material. Compressed air is cooled after the removal of moisture, and liquified. At extremely low temperature of minus 183 degrees C, oxygen is separated from nitrogen by means of a rectifying column. Three men are required for 8-hour shifts to operate this plant and fill the cylinders.

The acetylene gas-generating plant is capable of producing 750 cubic feet of acetylene gas per shift, and pumping this gas into cylinders at a pressure of 250 psi. The plant is mounted on a semi-trailer, the total weight of the plant and semi-trailer being approximately 32,000 pounds. The acetylene is produced from standard quarter-size calcium carbide and water and is of commercial purity suitable for welding. Two men per 8-hour shift are required to operate the plant, and fill the cylinders.

For ease of assembly  
and speed of installation  
of expansion and contraction joints

use **TRUS-ASSEMBLY**



It brings extra profits to the contractor by reducing installation costs to a minimum;

also saves the government money by eliminating maintenance expense caused by inaccurate alignment of dowels.

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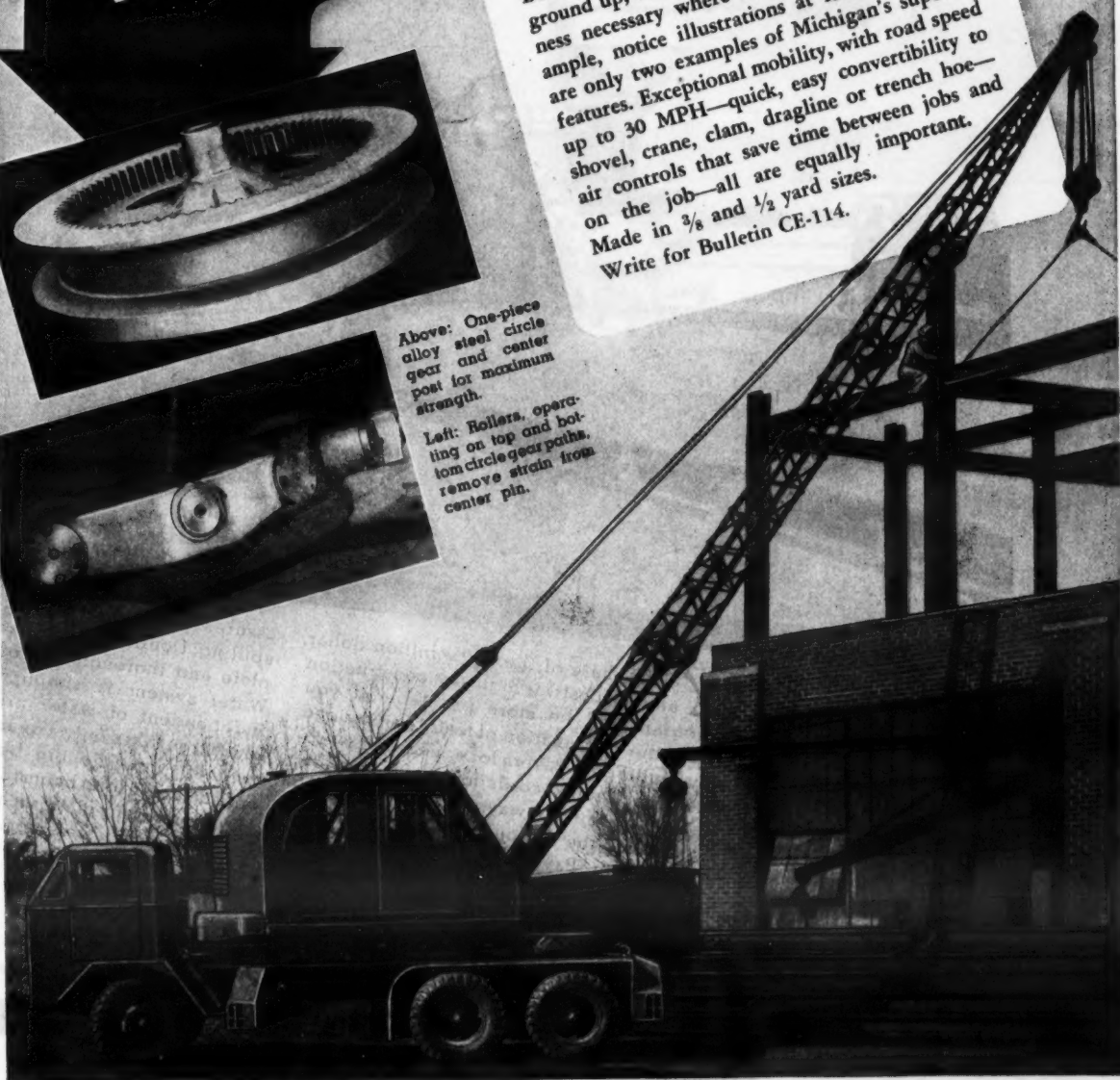
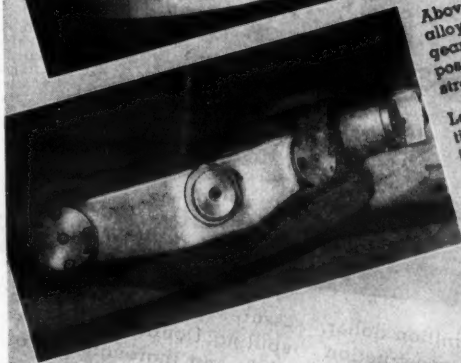
Chicago Heights, Illinois

**EXTRA RUGGEDNESS**  
Where It Counts Most

Built for long life and heavy duty from the ground up, Michigan has all the extra ruggedness necessary where it counts most. For example, notice illustrations at left. And these are only two examples of Michigan's superior features. Exceptional mobility, with road speed up to 30 MPH—quick, easy convertibility to shovel, crane, clam, dragline or trench hoe—air controls that save time between jobs and on the job—all are equally important. Made in 3/8 and 1/2 yard sizes. Write for Bulletin CE-114.

Above: One-piece alloy steel circle gear and center post for maximum strength.

Left: Rollers, operating on top and bottom circle gear paths, remove strain from center pin.



**MICHIGAN**

POWER SHOVEL COMPANY

BENTON HARBOR, MICHIGAN



### Aggregate Production

A new bulletin devoted exclusively to illustrations of crushing, sizing, conveying, and storage equipment for the production of stone, gravel, and sand has been issued recently by Rogers Iron Works Co., Joplin, Mo., as an aid to contractors and highway departments in planning their post-war equipment purchases. Among the illustrations are typical Rogers primary and secondary jaw crushers, both stationary and portable, equipped with folding elevators and power units; revolving and vibrating screens and scrubbers; complete port-

able crushing, screening, and loading gravel plants; crushing rolls; and dual crushing units and screening plants for quarry operations.

Copies of this Bulletin No. 402 may be secured direct from the manufacturer, or detailed information will be supplied on any one of the many pieces of equipment mentioned above. Just mention this review.

### New MobiLoader Folders

Models of the Athey MobiLoader, a versatile, speedy tractor-mounted loader for digging, hauling and dumping on a

wide variety of jobs, are described and illustrated in two folders available from the Athey Truss Wheel Co., 5631 W. 65th St., Chicago 38, Ill. One is devoted to the Model W4-1, designed for use with a Caterpillar D4 tractor, with a bucket capacity of  $1\frac{1}{8}$  yards, while the other covers the Model 8 MobiLoader, with capacities ranging from 2.7 to 9 cubic yards, for mounting on a Caterpillar D8.

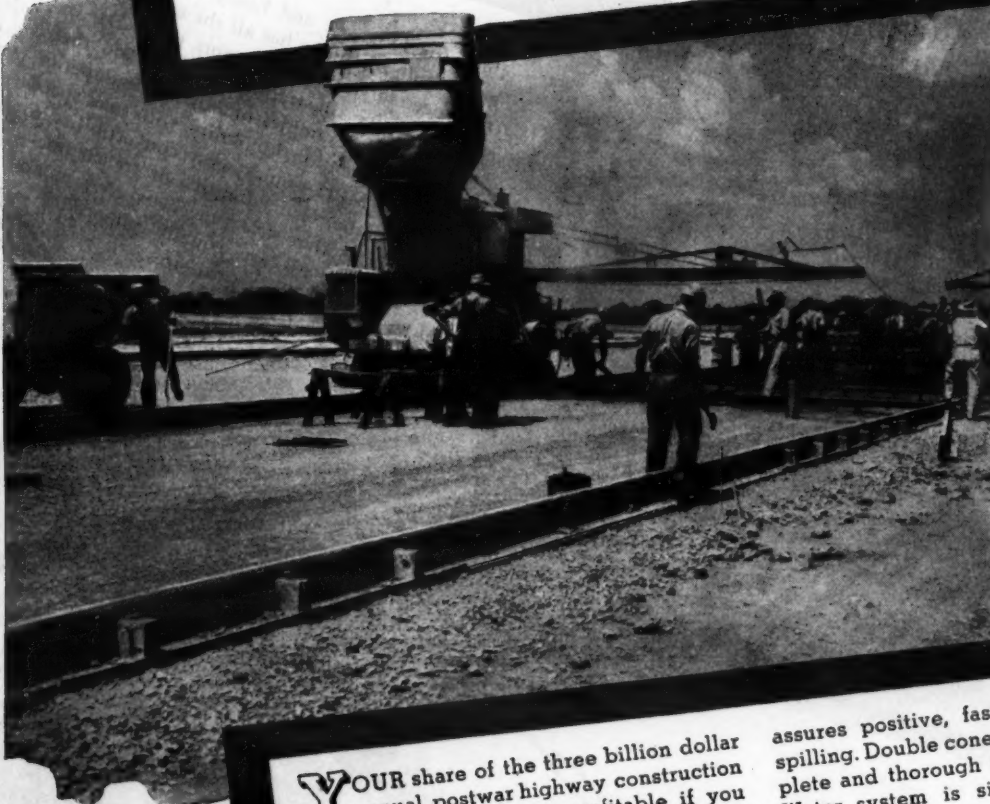
Copies of either or both of these folders may be secured by interested state and county highways departments and contractors direct from the manufacturer by referring to this item.

### Construction Equipment Wartime Sales Still Boom

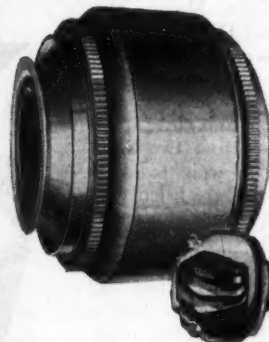
The data for the first quarter of 1944 on shipments and unfilled orders for five kinds of construction machinery, mostly for the Armed Forces, have recently been made available by the Construction Machinery Division, War Production Board, in comparison with similar data for the first quarter of 1943.

Product	Shipments		Unfilled Orders	
	1944	1943	1944	1943
Bulldozers	4,929	3,480	12,559	9,900
Road Rollers	754	513	2,454	2,011
Hauling Scrapers	1,212	1,351	4,220	2,011
Concrete Mixers	590	864	2,411	2,011
Contractors' Pumps	8,371	8,010	46,647	19,136

## Pave your way to POSTWAR PROSPERITY with MultiFoote Pavers



### HERE'S THE SECRET OF BETTER MIXING!



The double cone drum of the MultiFoote Paver gives end-to-end scouring action that insures a complete and thorough mix of every batch. There are no sharp angle corners where the mix can adhere and build up and be hard to clean. Openings are fitted with renewable wearing rings. Cut-away section shows drum interior and blade design.

**Y**OUR share of the three billion dollar annual postwar highway construction program will be more profitable if you have the combination of features provided by MultiFoote Pavers for speeding up production. Their records for speed and low cost paving of highways and airports everywhere are the reasons why there are more MultiFoote Pavers in service than any other make.

The big, wide, solid skip, which can take the battering of any batch truck,

assures positive, fast charging without spilling. Double cone drum provides complete and thorough mix of every batch. Water system is simple, accurate and independent of water pressure. Rotary discharge takes only a quarter turn to kick concrete into the big bucket ready to speed out the long boom to be discharged. High operating platform permits greater visibility and faster, more accurate work.

Write for details or see your local MultiFoote dealer.

**THE FOOTE COMPANY, INC.**  
NUNDA • NEW YORK

The World's Largest Exclusive  
Manufacturers of Concrete and Black Top Pavers

MultiFoote Pavers Conform to  
A. C. C. Standards and Specifications



# MULTIFOOTE

## CONCRETE PAVERS





## Methods and Costs Of Mud-Pumping

(Continued from page 29)

### Additional Equipment

The addition of a 6-ton trailer, 16 x 7 feet in size, for the 1944 work was an important factor in improving the efficiency of the mud-pumping operation, as all of the equipment could be placed on this trailer, acting as one unit. Two 300-gallon water tanks were mounted on the front of the trailer, and a one-sack concrete mixer on the rear. Suspended from the extreme rear and slightly lower than the mixer, the 7-cubic-foot mud pot was placed. The material, after being mixed, was poured into this pot, first being strained through a screen to remove lumps and foreign material. This mud container was converted from a sand container of a bridge sand-blasting outfit. Only one change was necessary; a 2-inch lubricator valve was placed at the exhaust end and a 1-inch heavy-duty rubber hose 10 feet long was attached to this valve. The nozzle on the end of the hose was a piece of rubber hose, 6 inches long, with an outside diameter slightly less than the diameter of the drilled holes. When the nozzle was placed in the hole, the pressure swelled the hose to a tight fit, allowing no escape of pressure or mud. A pressure of 80 pounds per square inch at the compressor was found to be the most satisfactory.

### Cost of Work

A total of 13,839 2-inch holes was drilled in 33 working days or an average of 419 holes per day, at a cost of 20 cents per hole. The average drilling cost per day was \$82.59.

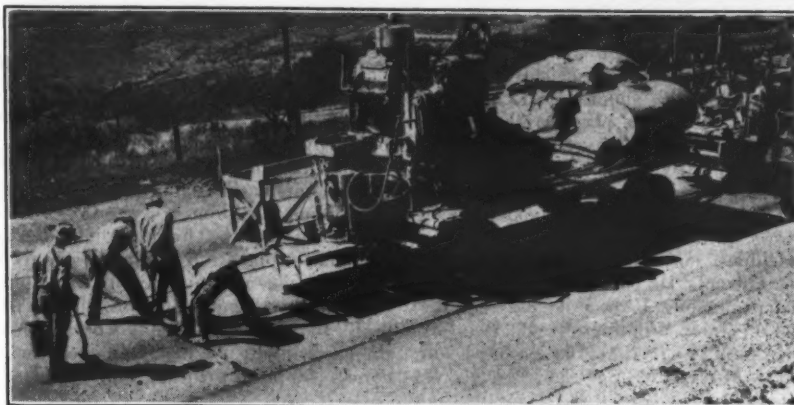
Mud-pumping these 13,839 holes required 50 working days or a total of 276 holes filled per day at a cost of 82 cents per hole. The average filling cost per day was \$227.50. For the entire work the cost of drilling and filling was \$1.02 per hole.

About 3.74 cubic yards of material was used per day and an average of 0.37 cubic foot of material was forced into each hole, although there was a variation of from 0.1 cubic foot to 7.0 cubic feet per hole.

### Methods

For the first portion of the work, two holes were drilled in each expansion and dummy joint per panel, with no attempt made to raise the depressed slabs to grade. As the work progressed it was decided to raise the depressed slabs and the locations of the holes were changed to 6 to 12 inches away from the joints, with two holes per panel, drilled 4 inches below the bottom of the pavement.

After this change in procedure, it was found that a larger amount of mud could be forced into each hole and the low slabs raised to grade fairly easily. The reason for this is probably due to the fact that where the crack-filling material had



California Division of Highways Photo

The District V mud-pumping outfit in action.

become broken or was missing in the immediate area of the hole drilled in the joint or crack, pressure was lost through this opening and it was then impossible to force very much mud under the slab. Also in many cases the low areas of the panels are at the joints and as the slabs

are resting on the subgrade there are no voids to fill at this point.

Redwood pegs 3 x 3 x 10 inches with a sharpened end were used to plug adjacent holes when pressure was desired to lift depressed slabs. An examination after two weeks showed that these raised

slabs were still at grade.

A chart on cross-section paper was kept, showing the location of all holes, by station and distance in from the edge and distance from the joint, in order to determine at a later date the efficiency of this mud-pumping after plant-mix blankets have been placed.

### Personnel

This entire mud-pumping program in District V of the California Division of Highways was under the immediate direction of Maintenance Foreman E. C. Van Schaick who is credited with the excellent results secured and for the various detailed experiments carried on in an effort to obtain the most efficient results. H. L. Cooper is District Maintenance Engineer, T. H. Dennis, State Maintenance Engineer, and G. T. McCoy is State Highway Engineer.

During the Sixth War Loan Drive, every individual is asked to buy an extra \$100 War Bond, at least. Let's go for the knockout-blow!

**FROM GUATEMALA**

**"Water-Cooling" Does the Job!**

**TO ATTU...**

Gardner-Denver W8F-210 Portable Compressor on bridge construction job in Guatemala.

Gardner-Denver W8K-500 Portable Compressor doing its bit on a road job on Attu Island.

**WON'T QUIT**  
or cause time out



A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

The Hayward Company  
32-36 Day Street  
New York, N.Y.

**Hayward Buckets**

For complete information and specifications, write Gardner-Denver Company, Quincy, Ill.

**M**ERCURY bubbling well over the hundred mark . . . heat like the breath of a blast furnace . . . yet this Gardner-Denver all water-cooled, all-weather Portable Compressor keeps breezing along . . . delivering cool, sustained air output, hour after hour.

Mercury hovering well below the zero mark . . . frigid blasts blowing straight out of the Arctic . . . but the all water-cooled, all-weather Gardner-Denver Portable Compressor warms up for a quick, safe,

easy start. No danger of burned-out bearings or scored cylinder walls from cold-weather starts here!

**WHY?** Because the cylinders are completely water-jacketed . . . assuring a uniform operating temperature, regardless of weather or latitude.

Regardless of temperature or altitude extremes, Gardner-Denver Water-Cooled Portables operate efficiently and dependably. Water-cooling assures economical operation—cuts lubrication costs.

Since 1859  
**GARDNER-DENVER**





### Chlorinated Solvents For Cleaning Metals

A booklet of standard practices for cleaning metals and other non-porous materials with chlorinated solvents has been prepared by E. I. du Pont de Nemours & Co., in consultation with G. S. Blakeslee & Co., of Chicago, and Detrex Corp., Detroit, manufacturers of degreasing equipment. Vapor degreasing is used for cleaning metal parts of all kinds, prior to inspection or assembly, and in preparation for subsequent processing or finishing operations such as rustproofing, painting, and galvanizing.

Glass and plastics are also frequently cleaned by this method. The essential part of the process is suspension of the material in the vapors of trichlorethylene, or sometimes perchlorethylene, so that the pure, condensed, liquid solvent rinses the parts completely free of grease and oil.

Copies of this 10-page booklet, which shows a number of typical degreasing machines, may be secured direct from the Solvents Division, Electrochemicals Department, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

### Carborundum Offers New Book on Grinding Wheels

"Grinding Facts," a 136-page reference book on grinding, has been prepared by The Carborundum Co. to acquaint grinding-wheel users with the newly announced standard markings for identifying grinding wheels and other bonded abrasives. This book includes a complete explanation of the new marking symbols; a comprehensive schedule of grading recommendations for general, tool-room, diamond-wheel, and thread grinding; a description of each common type of grinding; safety rules;

and a table of useful speeds.

A free copy of "Grinding Facts" may be obtained by writing on your company letterhead to The Carborundum Co., Niagara Falls, N. Y., and mentioning this item.

### New Distributor for Lima

The Rupp Equipment Co., 101 Great Arrow Ave., Buffalo, N. Y., has been appointed as an authorized distributor for Lima shovels, cranes, and draglines in western New York by the Shovel and Crane Division, Lima Locomotive Works, Lima, Ohio.

## AMERICA IS *Built with Aggregate!*

### SMOOTHER BEDS

Building the nation's vast network of railroads created a market for countless millions of tons of aggregate and each year millions more should be added to keep them smooth. During the past few years this has been impossible because of labor shortages.

The outlook now is for ballast to be one of the big markets for producers of crushed stone and gravel. The railroads have plenty of funds available for track maintenance and, if the supply of labor permits, they will use it for that purpose.

Cedarapids aggregate producing

### for RAILROADS!

and crushing equipment will help you produce better aggregate for ballast, highways, airports and other construction jobs, and it will cost you less too. Remember this — the Cedarapids line is complete and will meet any aggregate production problem either from the standpoint of output or character of materials for either an entire plant or a single piece of equipment. You'll be way ahead if you come to Iowa now for your essential needs and be one of the first in line for postwar deliveries. See your Iowa dealer right away or write direct.

IOWA MANUFACTURING COMPANY  
CEDAR RAPIDS, IOWA

Ewing Galloway Photo

**Cedarapids**

Built by  
IOWA

### THE IOWA LINE of Material Handling Equipment Includes

ROCK AND GRAVEL CRUSHERS  
BELT CONVEYORS—STEEL BINS  
BUCKET ELEVATORS  
VIBRATOR AND REVOLVING  
SCREENS  
STRAIGHT LINE ROCK AND  
GRAVEL PLANTS  
FEEDERS—TRAPS  
PORTABLE POWER CONVEYORS  
PORTABLE STONE PLANTS  
PORTABLE GRAVEL PLANTS  
REDUCTION CRUSHERS  
BATCH TYPE ASPHALT PLANTS  
TRAVELING (ROAD MIX)  
PLANTS  
DRAG SCRAPER TANKS  
WASHING PLANTS  
TRACTOR-CRUSHER PLANTS  
STEEL TRUCKS AND TRAILERS  
KUBIT IMPACT BREAKERS





## Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

### Job "Extras" or New Bids?

A public contractor skates on thin legal ice when he undertakes to do work not included in his original contract, unless the work is clearly incidental to that called for by the contract. This is true whenever the job is covered by a statute, ordinance or other similar regulation that requires competitive bidding for the award of contracts. We believe that the discussion below will show the necessity for caution before concluding that the extra work is so tied into the original job that it may be safely undertaken as a legitimate incident to the job. The discussion will also show that it would be a dangerous mistake to assume that standard contract clauses permitting changed construction are so elastic as to permit evasion of statutes requiring competitive bidding by enabling a successful bidder to perform two distinct jobs under the guise of doing one of them as an "extra" to the other. Yet, this does not mean that extra or additional work may not be done under the original contract if it is a legitimate part of the job covered by that agreement.

In a recent decision rendered in a case involving a contract for riprapping on a state highway embankment, the South Dakota Supreme Court said (Griffis v. State, 11 N. W. 2d, 138): "The statute under which the contract was authorized required that it be awarded after competitive bidding to the lowest competent and responsible bidder. \* \* \* Plaintiffs were bound to know that the Commission or the engineer in charge had no authority to bind the state by a new contract without complying with this statute," etc.

#### The Rule Exemplified

More than fifty years ago the Michigan Supreme Court reached a conclusion that still reflects the general attitude of the courts on the subject. (Ely v. City of Grand Rapids, 47 N. W. 447.) It was there decided that a contract to grade a street could not be enlarged to include paving of the gutters without submitting the additional work to competitive bidding, although the contract authorized changes in the work to be done. Rejecting a theory that the paving constituted a legitimate part of the improvement covered by the original contract, the court said: "Under this theory a contract to grade might be extended into a contract to pave; a contract to pave with stone into a contract to pave with wood or asphalt at a greatly increased cost; a contract for any distinct part of a public improvement into one for the whole". The court said that "distinct work" could not be done under a charter or contract clause authorizing changes or additions to a contract improvement. "It is of no consequence that a part of the public improvement is omitted from the estimate and contract by mistake."

#### Court States Test

Where a contract to fill park lands provided for payment on a cubic yardage basis, measured by the space filled, the Massachusetts Supreme Judicial Court decided that the contract could not be modified, without a new letting under competitive bidding, so as to provide for measuring the yardage on the vehicles hauling the materials. (Morse v. City of Boston, 148 N. E. 813.) After showing that the change in basis increased the contractor's compensation by about \$200,000, the court upheld a taxpayers' suit to restrain the excessive payment. The court said, in part, after referring to governing statutes:

"A critical comparison of these successive enactments discloses a progressive legislative intent to narrow the otherwise unlimited power of city officers, to the end that city contracts shall be free, open and honest. \* \* \*

"The city officers have authority doubtless to add to or to change the contract within reasonable limits in order to remedy incidental defects and to improve the work in minor details. \* \* \*

"An alteration which results in a substantially new contract as to a main element is not permissible under the statute. With reference to a construction contract of this character, the alterations which in view of the aim and words of the statute may be made without further compliance with the statute are only such as are incidental to full execution of the work described in the contract, and are of minor importance. \* \* \*

"Good faith does not warrant the violation of the statute. \* \* \*

"The argument of inconvenience, arising from the possibility of having two different contractors working upon the same job, if there must be another advertisement and award of contract under the statute, is not impressive. Mere inconvenience does not warrant departure from a statutory mandate. In instances where the public interest requires, and the detailed reasons are furnished by the proper city officers and published, advertisement may be dis-

terms of the statute."

#### Exceptions to the Rule

Cases where there was no reletting under competitive bids are illustrated by the decisions summarized below:

On discovering that there was quicksand underlying the site of a pier to be constructed under a bridge contract, the contract could be modified to provide for driving supporting piles. (Smith v. Miami County, 33 N. E. 243, decided by the Indiana Appellate Court.) The court said: "If, after the contract for a public structure has been duly made, and as the work of construction progresses, an obstacle arises, or if it be seen that, if the work be completed according to the contract, it will be insufficient or defective, or that by making slight changes the value of the work can be much enhanced,

the board ought to have the power to make such changes without giving further notice. If it have not, then will the public work be delayed, and the county often suffer loss."

Gravel could be substituted for crushed rock of a certain kind on a highway job where it was found that the rock could not be crushed, and where the contract reserved the right to alter the specifications. (Pyle v. Kernan, 36 Pac. 2d, 580, decided by the Oregon Supreme Court.)

Where a contract to construct a sewage treatment plant was let under specifications calling for bids upon contingent extras and providing for payment of cost plus 15 per cent on extras for which unit prices were not fixed, the New Jersey Court of Errors and Appeals ruled that a reletting was not necessary to cover changes designed to avoid unsafe features of the work originally specified. (Ippolito v. Borough of Ridgefield, 109 Atl. 337.) The court noted that the governing statute protected a municipality against imposition, because it was always open to judicial determination in a given case "whether the new work was occasioned by an unforeseen emergency or was but an incident of that provided for in the original contract, or was a mere effort to evade the statute".

#### Emergency Clauses

Governing statutes and charters often contain a clause which permits dispensing with

competitive bidding in "emergencies". Such an exception was applied by the California Supreme Court in the case of Los Angeles Dredging Co. v. City of Long Beach, 291 Pac. 839, involving a dredging job. A supplemental agreement to allow extra compensation for transporting dredged material was upheld on the ground that a change in work specification was necessitated by public safety measures. But the court recognized that "the term 'emergency' implies a sudden or unexpected necessity requiring speedy action". That is in line with a decision of the Massachusetts Supreme Judicial Court in a case where it was ruled that a defective condition of a street, not rendering it impassable, could not be regarded as such an emergency as to dispense with the necessity for inviting bids to furnish needed repair materials: "It is manifest that that language (special emergency) does not apply to a condition which may clearly be foreseen in abundant time to take remedial action before serious damage to the health or to the safety of person or property is likely to occur." (Safford v. City of Lowell, 151 N. E. 111.)

Whether we have a violent boom or depression in the immediate post-war years depends on what 50,000,000 customers and 3,000,000 business concerns do with \$20,000,000,000 of new funds created during the war years.

## TRAXCAVATE

### THE MODERN DIRT and MATERIAL HANDLING METHOD



Two of the fleet of TRAXCAVATORS owned by a prominent Chicago excavating contractor.

That's the way to get digging, loading, grading, and carrying jobs done quickly, at lowest cost! TRAXCAVATORS are modern tractor excavators that combine in one machine the usefulness of a shovel, loader, scraper, bulldozer, etc. They move around jobs easily under their own power; can readily be transported on streets and highways. Powered by "Caterpillar" track-type tractors, with bucket capacities from  $\frac{1}{2}$  to  $2\frac{1}{2}$  cubic yards. Bulldozer blade quickly interchangeable with the bucket; other attachments also available. Your Trackson-"Caterpillar" dealer will be glad to show you, in interesting facts and figures, why TRAXCAVATOR users say, "Traxcavate!" Or, write for literature to TRACKSON COMPANY, Milwaukee 1, Wisconsin

BACKFILLING  
Concrete Wall

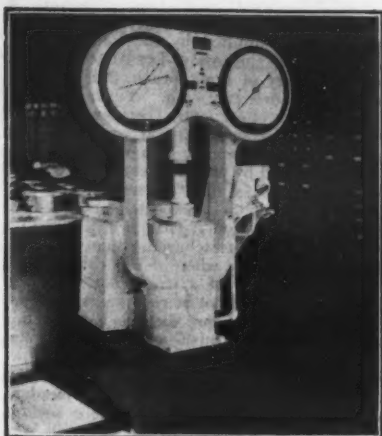
DIGGING  
and LOADING

MATERIAL  
HANDLING

# TRAXCAVATOR

The Original Tractor Excavator





The Southwark-Emery 90,000-pound testing machine has found a new use in cement testing because of developments in concrete practice.

### Compression Tester For Newest Cements

The new air-entraining cements which have recently come into prominence have reawakened interest in the compression tests of 2 x 2-inch cement cubes, because these cements are probably better tested in compression than in tension, according to F. G. Tatnall, head of the Baldwin-Southwark testing machine division of The Baldwin Locomotive Works, Paschal P. O., Philadelphia 42, Pa. The 90,000-pound Southwark-Emery compression testing machine made by this division has in the past been widely used for the compression testing of cubes and cylinders. To date there are over 125 in use in the United States among cement companies, highway departments, and government laboratories.

This cement tester was introduced in response to the requirements established in the early 1930's by a committee of the American Society for Testing Materials, which required all possible testing refinements so as to permit distinguishing very fine points of quality difference in cements. For example, the requirements for such a machine were that it should have an accurate "rate of loading control" paced by Telechron-operated disks. Other requirements were that it should have a separate weighing system, which in this case is provided by the Emery capsule, and that it have adequate dial scale length and requisite accuracy over the operating ranges. This is provided on the Southwark-Emery compression testing machine by the two dials of 33-inch scale length each, one of 90,000 pounds and one of 10,000-pound capacity.

Full information regarding this compression machine may be secured direct from the Baldwin-Southwark Division by mentioning this illustrated item.

### Universal Loader Catalog

A versatile loader suitable for handling heavy machinery and many types of material, and which may be adapted, through the use of available attachments, to use as a bulldozer, crane, portable scaffold, portable elevator, snow plow and for many other purposes, is described and illustrated in a 6-page catalog issued by the Lull Mfg. Co., 3612 E. 44th St., Minneapolis 6, Minn. This Universal Loader is made in six models to fit all standard wheel-type industrial

tractors ranging from 20 to 60 hp. The bucket attachments are made in sizes from 7/16 to 3 cubic yards.

Copies of this descriptive catalog may be secured upon application to the manufacturer and mention of CONTRACTORS AND ENGINEERS MONTHLY.

### New High-Precision Slide Rule Available

In introducing its new high-precision slide rule, the Charles Bruning Co. stresses the fact that this instrument, No. 2401, is not a "duration substitute". A special feature of this new 5-inch pocket slide rule is the precision of its graduations, which are molded in and will not lose visibility through use. The graduations and numerals of the CI scale are in red to facilitate reading. The indicator is of glass and is easily replaceable in the event of breakage. This indicator is enclosed in a frame of stainless steel that holds it firmly in place and eliminates "wobble". The

beveled edges of the rule are in graduated scales of both inches and centimeters.

Further information on this new pocket slide rule, which comes complete with

natural leather case and instruction booklet, may be secured direct from the Charles Bruning Co., Inc., 4700 W. Montrose Ave., Chicago, Ill. Just mention this item.

Write For Details



### A TOUGH ROLLER FOR TOUGH JOBS

Pierce-Bear 2-5 Tons Variable Weights

Engineered for economical operation where the going is tough. Compact, easy to operate. Narrow rear roller gives heavy-duty compression. Built-in water tanks for wet rolling. Powered with Allis-Chalmers Industrial Heavy-duty Model "B" gasoline engine.

Manufactured by

H. W. LEWIS EQUIPMENT COMPANY

431 Hudson Avenue  
SAN ANTONIO 3, TEXAS  
Phone: Garfield 6137

SAVINGS OF \$90 PER DAY... PLUS 2/3 MORE OUTPUT

... with this 34E Single Drum Paver



Pouring concrete into hollow steel piling 10 inches in diameter by 70 feet long was the assignment for this Ransome Paver. Using the Hydraulically Controlled Boom Bucket to full advantage, the operator spotted the bucket over the piling hopper with the finger-tip hydraulically controlled valve, then opened the bucket gates about 2 inches to allow a narrow smooth-flowing stream of concrete which permitted air to escape while filling the pile, thus speeding up the job.

With the Ransome Hydraulically Controlled Boom Bucket, split batches were eliminated in the mixing drum. Thus, the operator could finish a pile with the exact quantity of concrete required, swing the boom bucket to the next pile, and discharge the balance of the batch without returning the bucket to the mixer. The contractor stated that 2/3 more concrete was poured using this bucket with four less men in the pit, the services of a 1 1/2-yard crane and operator were eliminated, with a saving of \$90 per ten hour day.

Write for full information on Ransome 34E Single and Dual Drum Pavers equipped with this time-and-money-saving distributing bucket.

### VULCAN TOOLS

A complete line for every type of Rock Drill, Pavement Breaker and Clay Digger.

Vulcan Tool Manufacturing Co.

31-43 Liberty Street, Quincy 7, Mass.

Branch Offices and Warehouse Stock:

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Ransome MACHINERY COMPANY

DUNELDEN, NEW JERSEY

SUBSIDIARY OF WORTHINGTON PUMP AND MACHINERY CORPORATION



## Toledo Paving Job Made Test Project

(Continued from page 30)

The subgrade was finish-graded by a Galion Model 101 motor patrol with a 12-foot blade. A 6-inch concrete-pipe underdrain was installed just 1 foot inside the curb line at an average depth of 4 feet below the pavement elevation at the curb. All lateral seepage is thus intercepted outside the blanket course. This drain was covered with a porous backfill of crushed stone, of about 3/8-inch size, to the top of its trench, or to a 3-inch cover, whichever was less. Two Rex Model 10M 2-inch pumps, each with a capacity of 10,000 gph and mounted on pneumatic tires, were used to dispose of surface and underground water during construction.

As soon as the blanket course for half the width of the road was completed, concreting operations began. Batching was done off the site by a local subcontractor and the batches were mixed in the contractor's Ransome 34-E paver. The 40-foot width of roadway has a crown of 4 inches and was poured in four 10-foot-wide strips, consecutively from the south to the north side, stopping after the second strip to permit preparation of the north half of the subgrade and blanket course. The slab is 9 inches thick throughout and carries no reinforcing steel, but has a standard keyed construction joint between the strips.

Truscon Tru-Cure was used for the curing, the specifications requiring that the film of this material, sprayed on through an atomizing nozzle, retain at the end of three days at least 85 per cent of the original water in the concrete.

### Major Quantities and Personnel

Some of the major quantities on this project were:

Item	Quantity
Removal and disposal of existing pavement	21,840 sq. yds.
Roadway excavation, unclassified	13,681 cu. yds.
Classified embankment material for blanket course	11,108 cu. yds.
Portland-cement concrete pavement, 9 inches thick	21,767 sq. yds.

The contract for this 4,668-foot section of repaving on Fearing Street in Toledo, Ohio, was awarded to Launder & Son, Inc., of Toledo, for \$158,608.65 by the Ohio Department of Highways. E. K. Bridge was Superintendent for the contractor. Field control of the two special concretes was under the direction of K. F. Kapff, Concrete Control Inspector for the Department of Highways, for which C. B. Patterson was Project Engineer. E. L. Reeb is Division Engineer of Division 2, in which this project was located, and E. B. Bauer is Assistant Division Engineer in charge of all construction in the division. H. G. Sours is Ohio Director of Highways.

### Improved Air Duct Aids Construction

A new type of flexible but non-collapsible portable air duct, developed to meet wartime needs, but adaptable for either blower or exhaust systems in tunnel construction, has been developed by engineers of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. This improved Ventube flexible ventilating duct is a sleeve or tube of standard Ventube impregnated cloth, either regular or fire-resistant, with a tempered-steel helical spring inside of it. Thus the maximum air-flow opening is maintained regardless of whether the duct is bent sharply or the system is blowing or sucking air. When bent to an angle of 180 degrees, it will exhaust eight times more air than the old-style tubing, it is stated.

The tube is made by impregnating and coating especially selected fabrics with high-grade abrasion-resistant com-

pound that is also water-resistant and impermeable to air. The fabric is also highly resistant to heat, moisture, mildew, and dry rot. If the covering of the new Ventube is burned by a welding torch or cut through, it can be patched like an automobile inner tube.

Much of the use of this Ventube has to date been by shipbuilders who have tested and reported it more efficient, more flexible, lighter in weight, and less easily damaged by rough handling than ordinary types of such tubing. The new duct weighs only half as much as an equivalent length and diameter of the earlier-type non-collapsible Ventube.

Complete information regarding this newest ventilating duct may be secured direct from the manufacturer.

Highway patrolmen of one midwestern state have expressed willingness to cooperate with commercial motor-vehicle operators by participating in driver-training programs. The objective is to conserve equipment through accident prevention.



# FREE!

ONE OF THE MOST  
VALUABLE WORKS EVER  
WRITTEN ON PUMPS

Modern self-primers do amazing jobs in crucial places. Intimate knowledge of this "new kind of pump" is increasingly important to men who build. This clear, concise, illustrated handbook gives the facts you should know. Send for a copy.

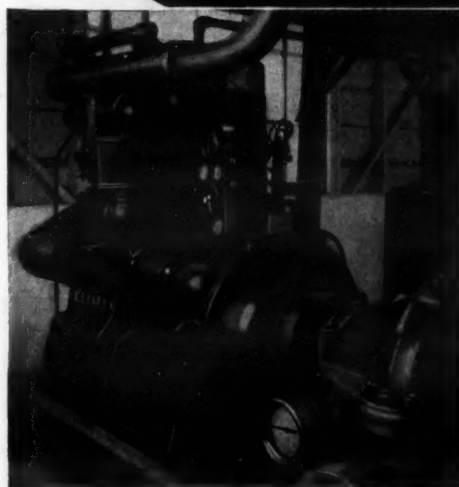
## MARLOW PUMPS

Makers of Modern Self-Priming  
Centrifugals

RIDGEWOOD, NEW JERSEY

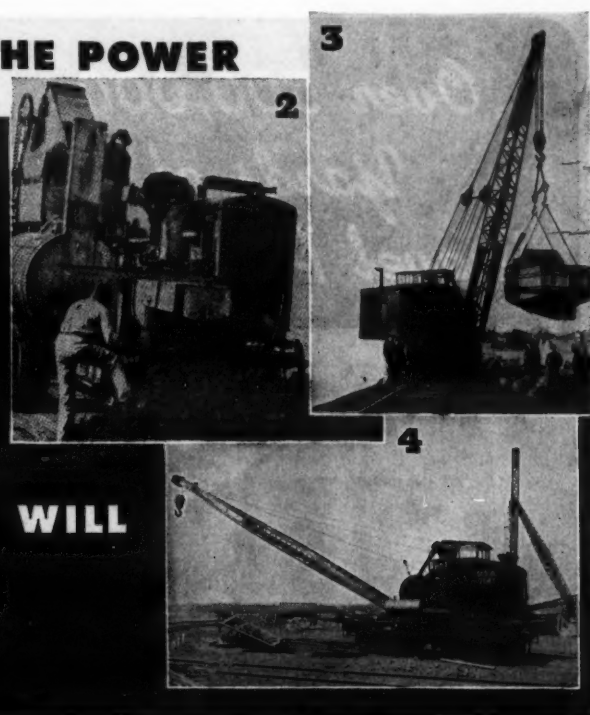
## LET Climax SUPPLY THE POWER

for  
**WHATEVER  
CONSTRUCTION  
EQUIPMENT YOU WILL  
BUILD OR OPERATE**



SEND FOR Climax engine bulletins which give full information — specifications, performance curves, outline dimensions and complete description. Address your letter to Climax Engineering Company, 1811 South Fourth St., Clinton, Iowa.

IT WILL PAY YOU TO USE  
**Climax**  
Blue  
Streak GAS ENGINES



**1** Standby power for the fire protection reservoir and pumping station in an aircraft plant is furnished by this Climax Model N48 engine.

**2** This Cedarapids "Roadmix" made by Iowa Mfg. Co. and powered by a Climax Model R61, is but one of the numberless profitable applications for this versatile power plant.

**3** Fast agile horsepower is obtained from this 35-42 Ton Industrial Brownhoist Locomotive Crane, built for the U. S. Army.

**4** For dependable power in small space this Industrial Brownhoist is equipped with a Climax R61 (166 h. p.) engine.

IF YOU HAVE A Climax engine on your equipment, you'll never have to worry about the power. These Blue Streak engines possess every modern refinement that technical ability and experience indicate as desirable.

The simple, well-balanced design promotes high operating efficiency and dependability. The low piston speeds and moderate compression ratios insure nominal maintenance and long life. Blue Streak Combustion, an exclusive Climax feature, gives unusually high horsepower output on little fuel. The special shape of the combustion chamber, and placement of valves and spark plugs reduce detonation when engine is overloaded, improve gas mixing and scavenging. Deep and wide water passages provide ample cooling and maintain low, safe running temperatures.

Other features which contribute to peak performance include: fast electric starting; dual ignition and dual carburetion; governors for close speed regulation, and complete accessory equipment which permits the engine to be "tailored" to the most exacting requirements of a specific load.



**Climax Engineering Company**  
GENERAL OFFICES AND FACTORY: CLINTON, IOWA  
REGIONAL OFFICES: CHICAGO, ILLINOIS • DALLAS, TEXAS

Affiliated Companies: McNair Mfg. Co., Chicago • Hanton-Waters Co., Tulsa





Official U. S. Navy Photo  
International diesel TracTractors with dirt-moving scrapers at work on the big bomber base built by the Seabees on Espiritu Santo in the New Hebrides.

## Old Railroad Rails For Bridge Railing

At the start of the present war, the Bridge Department of the California Division of Highways purchased a large stock of old railroad rail to be used primarily for reinforcing in concrete

structures as a wartime emergency. Most of this railroad rail was a 45-pound section and in 30-foot lengths.

A great number of uses has been made of this rail besides using it as reinforcing. In one case, it was placed as a deck on the stringers of an old steel bridge, and the space between the rails filled

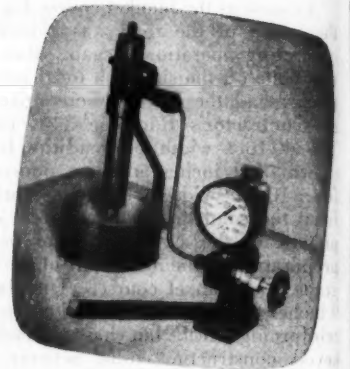
with concrete. In other instances, it has been used as cattle guards and gratings. Its use as a bridge rail and wheel guard on the end of structures has helped in conserving materials needed in war construction. The appearance and practicability have more than proved its worth in all cases where it has been used.

A substitute, as a rule, is inferior to and less acceptable than the product for which it pinch-hits. However, this was not found to be true in the case of a substitute rail designed for the Poso Creek Bridge in Kern County, Calif., between Woody and Isabella. According to a report in *California Highways and Public Works*, the old structure across Poso Creek was damaged beyond repair by flood waters, and it was necessary to prepare plans and build a new structure without the use of critical war materials. For a small structure located off main arterial highways, it is customary to use a standard redwood rail which has been developed and used for a large number of years because it has been found to

give excellent service. Timber of any kind has become so critical during the war that a substitute railing of non-critical materials which could be used to replace the standard timber rail had to be devised.

It was decided to substitute the railroad rail for the timber in the standard bridge guard railing. The new railing is pleasant in appearance, safe, and sturdy, which is all that can be asked of any guard rail.

## ADECO NOZZLE TESTER



## KEEP DIESEL ENGINES RUNNING AT PEAK EFFICIENCY

With this sturdy, portable, light-weight Adeco Nozzle Tester, any mechanic can easily make quick, accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Adeco advantages have made this America's most widely used nozzle tester. Tests both large and small injectors, on bench or engine. Avoids costly delays and possible damage to engine. Keeps diesels operating at peak efficiency.

Write for new illustrated bulletin.



AIRCRAFT & DIESEL  
EQUIPMENT CORPORATION

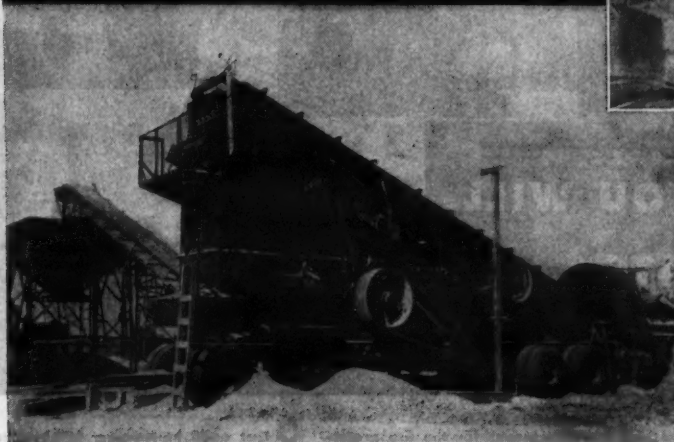
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**FOR VICTORY**  
BUY UNITED STATES  
WAR BONDS AND STAMPS

Over 500,000  
Yards of  
Gravel Per Year!



Success stories of Universal plants are many. Typical is the one recently received from Cage Bros. & J. Floyd Malcolm, Texas, gravel producers. They have given us the following report on their Universal Gravel Crushing, Screening and Loading Plant:

Maximum yardage per hour: 400 yards of material 2" and under.

Average production in continuous operation: 275 yards per hour.

Average annual production: over 500,000 yards.

This compact portable plant consists of a 1036 primary jaw crusher, 40" x 24" secondary roll crusher, 2½ deck 4' x 12' screen, rotovator and conveyors—a lot of gravel produced with a minimum of equipment.

Ask any user of Universal equipment about production costs, fuel consumption, bearing life, maintenance costs and other operating factors. When results are checked, Universal is the choice!

**UNIVERSAL ENGINEERING CORP.**  
620 C Avenue, West Cedar Rapids, Iowa



**UNIVERSAL**  
CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADER-ROLLERS, PORTABLE ASPHALT PLANTS



## Get Behind the A.R.B.A.!

Officials of the American Road Builders' Association have issued a plea to members, affiliated organizations and other interested parties to launch a well integrated post-war highway building program at once so that the wheels can be set in motion immediately upon conclusion of the war.

A copy of "A Sound Plan," detailing the program to hedge against post-war deflation is available to those interested, from the A.R.B.A., 1319 F St. N. W., Washington, D. C.



# Light Timber Bridge Serves Montana Mine

## Single-Lane Truss Bridge Carries Loads Too Heavy For Old Steel Structure: Holes Drilled for Piling

AS a wartime measure to permit delivery of heavy loads of chrome from the Benbow and Monat mines of the Anaconda Copper Co. to the railroad, the Montana Highway Commission designed an economical timber bridge to cross the Yellowstone River near Columbus, Mont., as a unit of a Federal access road initiated by the Defense Plant Corp. The contract for the bridge unit was awarded to Walter Mackin, Billings, Mont., and the work supervised by the Highway Department acting as the construction agency for the Public Roads Administration. An old county-built steel truss with a 15-foot roadway and H-8 operative loading, located at this point, was inadequate to serve the expected heavy haul from the mines, so it was designated as a one-way bridge to carry the empty trucks while the new bridge, designed for an H-15 loading, was built immediately downstream, using the same approach roads, to carry the outbound loads of chrome.

### Truss Design

The north approach consists of four 25-foot trestle spans with 8 x 18-inch stringers, and a single span of similar construction forms the south approach. The main spans are five 88-foot pony trusses having a 13-foot clear roadway between curbs and a 14-foot 8-inch clear height.

These trusses, designed for an H-15 loading, have six 14-foot 8-inch panels. The bottom chord is built of two 4 x 16's and the top chord of two 4 x 14's with a 6 x 6 bolted between them. The vertical posts are 6 x 12 and 8 x 12, and the diagonals are two 3 x 15's with a 4 x 14-inch spreader bolted between them. The two trusses on 16-foot centers are braced by 8 x 12-inch struts at the three center posts with 6 x 6 diagonals between them above the top chord and 6 x 6 diagonals under the floor beams.

The floor beams are 6 x 22-inch timber bolted to each side of the vertical

posts, their tops 3 feet 10 inches above the centers of the bottom chords, and extended 4 feet outside the trusses to provide anchorage for 6 x 12-inch exterior braces to a point 2 feet 3 inches below the centers of the top chords. These floor beams support the eight 8 x 14-inch stringers, the outside ones butted and the inside ones lapped, which carry the 2 x 4-inch laminated deck with a 1½-inch bituminous surface.

All connections were made with Teco split rings and black-iron bolts cut to project not less than ¼, nor more than ½, inch. Malleable-iron washers were used in all connections.

### Timber Piers

The trusses are supported on piers constructed of eleven piles, clusters of four at 2-foot 6-inch centers under each truss shoe, one pair at the mid-length of the pier, and one driven upstream on the pier center line to form the nose of the ice breaker. The piles are braced by 8 x 12 struts running longitudinally of the pier, with 12 x 12's in the upstream cluster at the ice-breaking nose, and 8 x 8 struts set at right angles between the opposite piles forming a pair. Diagonals of 8 x 12's from the upper portions of the upstream piles to the lower portions of those downstream furnish additional stability against ice damage. Outside the piles 3 x 12-inch sheathing was placed horizontally for a distance of about 11 feet, from below low water to a point 3 feet above anticipated high water.

Above the pile cut-off line, two 12 x 12-inch caps were placed the length of the pier and connected by six 12 x 12 blocks 3 feet 6 inches long placed transversely on their tops, two under each truss bearing and one at each of the one-third points. On top of these, two more 12 x 12-inch caps 20 feet long support the trusses and the frame, which is built of 12 x 12 posts with 12 x 12 x 16-foot caps to carry the floor stringers through the truss connections.

### Pile Driving

Except at two piers in mid-channel, the shale was covered by an overburden of sand and gravel sufficiently deep and



C. & E. M. Photo

The new timber bridge across the Yellowstone River is here seen from the downstream side, with the old steel structure, used for one-way traffic, beyond it.

stable to assure lateral support so the piling was driven to the supporting shale from falsework by a 2,800-pound drop hammer in a timber skid rig with 32-foot leads and a 2-drum gasoline-powered hoist. The piles varied in length from 18 to 40 feet.

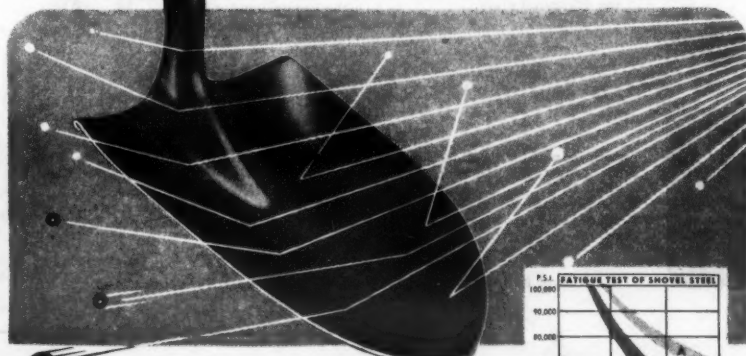
At the two piers in the main channel,

the overburden was less than 3 feet deep and it was necessary that the piling enter the shale for lateral anchorage. The falsework was set on framed bents anchored to the old bridge upstream, after which a small dragline was used to remove the gravel from the sites of the

(Concluded on page 73)

**HEIL BULLDOZERS**  
[TAILOR-MADE FOR CLETRAC TRACTORS]  
handle "bonus" loads quickly... economically... to give you more yardage at low cost

## THEIR HEAT TREATED "SURFACE PEENED" STEEL RESISTS "FATIGUE" 2½ TO 5 TIMES LONGER



### to give contractors a finer RAZOR-BACK Shovel

The strongest light shovel on the market (because of 13 gauge center backbone tapering to 17 ga. at sides) is now even tougher and longer lived. Improved heat treatment with "Surface Peening" adds 2½ to 5 times more resistance to the bending fatigue that makes ordinary shovels break. Send for Catalog and prices.

THE UNION FORK & HOE COMPANY  
662 Hocking Street, Columbus 15, Ohio

### COMPARATIVE TESTS:

Compared under standard fatigue tests (up to 10 million cycles) RAZOR-BACK "Surface Peened" steel ("A" on test curve above) withstands continuous 2-way bending 2½ times longer than fine heat-treated steel "B" at extreme of 90,000 p.s.i., 5 times longer at 80,000 p.s.i., shows no fatigue failure at 70,000 p.s.i.



### HEIL BULLDOZERS ASSEMBLE COAL PILES FOR PICK-UP BY CLAMS

This Heil hydraulic bulldozer mounted on a Cletrac tractor is doing an excellent job in cleaning up the dock floor of a coal yard. The operator appointed for this job found the controls easy to handle, and in a short time could bulldoze a path that looked like the work of a sweeper. Write for full details B-40

Note the operator's unobstructed view and the convenience of the controls that enable him to work accurately with no loss of speed. Heil engineers have pioneered the modern practice of replacing heavy cast members with welded box sections that are lighter, stronger, and easier to repair in the field without costly, time-consuming delays.

For full loads and more yardage — at lower cost — use Heil Bulldozers and other famous Heil Earth-moving equipment. Write for bulletins today

See Your  
CLETRAC TRACTOR DISTRIBUTOR

**THE HEIL CO.**  
GENERAL OFFICES • MILWAUKEE 3, WISCONSIN



## Program of Patching Texas State Highways

(Continued from page 50)

not impede surface drainage.

In other localities a patching material known as No. 1 stencil aggregate is used, which has the following gradation:

	Per Cent
Retained on 3/8-inch screen	0
Retained on 1/2-inch screen	0-10
Retained on No. 10 mesh screen	60-75
Retained on No. 40 mesh screen	75-90
Retained on No. 100 mesh screen	85-97

Either of these types of cover material, also obtained on competitive bids and stockpiled in advance, is delivered from the stockpiles to trucks by a Barber-Greene bucket loader, one laborer assisting the operator.

Prior to the application of asphalt, a strip 3 feet wide down each edge of the road surface is swept by a Grace rotary broom pulled behind an available truck. RC-2 asphalt from one of the district's 11,500-gallon-capacity storage tanks, or from cars shipped in to conveniently located railroad sidings, is heated by a Cleaver-Brooks tank-car heater, and delivered in booster tanks with a capacity of 600 to 2,000 gallons, mounted on Ford or Chevrolet trucks, to the point of use, where it is transferred to the 1,050-gallon Etnyre trailer distributor pulled by a Ford truck. This distributor then applies the asphalt on the 3-foot strip.

The cover material is distributed by the trucks on top of the shot of asphalt at the rate of approximately 1 cubic yard to each 150 square yards of surface. This operation is performed by setting 4 x 4 blocks inside the truck body, so that when it is raised and the tail-gate opened for a few inches, gravel can be discharged through only the center 3 feet of opening. The truck is driven with its wheels straddling the asphalt strip with the 3-foot center discharge falling directly into place. A small rubber-tired 2-wheel blade grader, with an 8-foot blade and pulled by a Farmall tractor, spreads the aggregate which is then rolled by a Littleford motorized wheeled roller.

The crew ordinarily engaged in this operation consists of a foreman, five truck drivers, one heater operator, a driver and operator for the distributor, one roller man, two men on tractor and blade, one Barber-Greene loader operator, one operator for the rotary broom, and one to three laborers. It is customary for this crew to apply from 10,000 to 15,000 gallons of asphalt with cover coat in a 12-hour day.

### District Statistics

The Amarillo District of the Texas Highway Department, as large as some of the eastern states, is comprised of eighteen counties, its boundaries being from 60 to 170 miles from the District Office. Of the 1,299 miles of road under state maintenance, 300 miles are concrete, 175 are dirt, and the balance various types of bituminous surface.

The District Office, which handles its maintenance operations through a general foreman and nine section foremen,

each having twelve to thirty men under his direction in normal times, and responsible for 115 to 190 miles of road, also makes surveys, plans and estimates, and supervises all construction done in the district. James G. Lott is District Engineer, Lon C. Ingram is Assistant District Engineer, and F. I. Gallas is General Maintenance Foreman.

### Shell Executive Dies

David Waxman, Manager of the Asphalt Sales Department of the Shell Oil Co., New York City, and a Director of The Asphalt Institute, died on August 29 at the age of forty-six. Following graduation from the University of Pennsylvania in 1919, Mr. Waxman served suc-

cessively with the Pennsylvania State Highway Department, the Construction Division of the Army Quartermaster Corps, the Pittsburgh Testing Laboratories at Birmingham, Ala., and the Sam E. Finley Co., of Atlanta, Ga. He became associated with the Shell Oil Co. in 1926, first in the New Orleans Office, then in St. Louis, and later in New York.

## Fast Cutting WITH CLEVELAND SINKERS

• Easy-holding, air-saving Cleveland sinkers, made in many sizes from 32 to 78 lbs., are equally popular with miners, contractors, and quarrymen. Several types available in wet or dry construction, and with chucks for collared drill steel, and plain or lugged shanks.

**PROMPT DELIVERY**—Orders carrying AA-5 priority shipped within a week, subject only to higher priorities. *Immediate shipment on spare parts—as always! Ask for Bulletin 122, and Cleco Cartoons that tell you how to get more work out of your drills at less cost.*

*Speed Victory—Buy More War Bonds!*

### LEADERS IN DRILLING EQUIPMENT

## THE CLEVELAND ROCK DRILL CO.

DIVISION OF THE CLEVELAND PNEUMATIC TOOL COMPANY  
CABLE ADDRESS: "ROCKDRILL" • CLEVELAND 5, OHIO

**MODEL H11**  
Leader in the 55-pound class for soft, medium, or hard rock.

**MODEL H10**  
An excellent general-purpose drill, favorite in the 45-pound class.

**MODEL H66**  
The light drill with the big wallop, for shale, limestone, etc.

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### CANADIAN DISTRIBUTORS

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Our landing craft, which have put hordes of fighting men and machines on enemy shores with incredible speed, have impressed the world with their efficiency. Impressive too, is the efficiency with which Owen Buckets operate—taking capacity grabs of materials quickly—discharging them speedily—handling great yardage at low cost.

**THE OWEN BUCKET CO.**  
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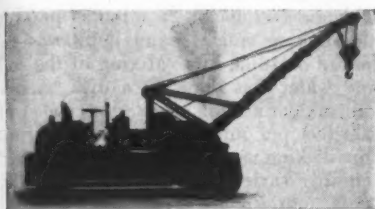
# OWEN BUCKETS



★ If War Bonds aren't safe,  
no other investment matters.  
So buy War Bonds with every  
dollar you can find.

**6th WAR LOAN**





The new Link-Belt Speeder Cargocrane.

### New Service Crane For Unloading Jobs

A 10-ton capacity Cargocrane which was developed at the beginning of the war for the Transportation Corps of the U. S. Army will be on the market for civilian use when peace comes. The Model YC-9 Cargocrane, made by Link-Belt Speeder Corp., 301 W. Pershing Rd., Chicago, Ill., has a wheelbase nearly 11 feet long, an overall length of 13 feet 6 inches, and an overall width of 7 feet 6 inches. It is wheel-mounted on solid or pneumatic rubber tires with all controls and steering hydraulically operated. The upper machinery is mounted on a 44-inch cast-steel turntable equipped with hook rollers and oversize center pin permitting full-circle operations. The telescopic boom extends from 14 to 20 feet and is raised and lowered by an independent self-contained worm boom hoist. The entire unit is operated by a three-speed transmission from a 40-hp gas engine for traveling, swinging, hoisting, and boom hoist. There are three traveling speeds forward and one reverse with a low speed of 1.9 mph and a high speed of 6.75 mph.

This Cargocrane is particularly serviceable in loading and stacking materials and boxed parts in yards and storehouses, and should be useful in large service garages of highway departments because of its capacity and mobility.

Booklet No. 2033 fully describing this machine may be secured by contractors and highway department engineers direct from the manufacturer by mentioning this news item.

### Sheepsfoot Rollers Described in Catalog

A line of tamping rollers, designed for the efficient compaction of loose fill on all kinds of construction projects where rapid preparation of the subsoil is desired, is described in a 4-page catalog issued by The Heil Co., 3000 W. Montana St., Milwaukee 1, Wis. These rollers are reported to be of heavy construction, with drums of heavy steel plate and sheepsfeet of drop-forged steel, heat-treated to resist wear, with removable and replaceable feet-cleaning attachments as well as a rear hitch furnished as standard equipment. Three sizes are available, with single, double and triple drums. In addition to detailed descriptions and illustrations of several models, the catalog also includes complete specifications.

Interested contractors and highway engineers may secure copies of this Bulletin No. RM1839 by applying direct to the manufacturer and mentioning this review.

### Universal Atlas Appoints New York Sales Manager

Edward J. Head has been promoted by Universal Atlas Cement Co., New York City, a subsidiary of U. S. Steel Corp., to the position of Sales Manager in New York, and is succeeded by Foster A. Hagan as Assistant Sales Manager in the same area. Mr. Head was active in coordinating the company's activities in Washington, D. C., during the early days of the defense construction program, and in 1941 left for British Guiana as coordinator and Assistant Project Manager for the Elmhurst Contracting Co. in the construction of the Army base at Georgetown. He rejoined Universal Atlas in 1942 as Assistant Sales Manager.

Mr. Hagan, who has been associated

with the company since 1942, has been acting as special representative in metropolitan New York. Previous to that time he was a salesman for the Lehigh Portland Cement Co.

### New Davey Dealers

The Davey Compressor Co., Kent, Ohio, manufacturer of portable and stationary air compressors, truck power take-offs, and pneumatic saws, has announced the appointment of the Meco Sales Co., 800 East 67th St., Cleveland, Ohio, and the Air Compressors Rental Co., 2324 East 105th St., Cleveland, as dealers in that area.

The former company, of which Charles Easley is President and R. R. Fortney General Manager, will handle a complete line of industrial compressors and parts. The latter company, headed by Patrick Antonelli and William Cesa, will combine complete sales and rental facilities for portable compressors and an adequately stocked parts department for service to Davey equipment users.

## RAPIDITY!

## UNIFORMITY!

## SATISFACTORY!

Contraction joints *MUST* or should be installed within the "opportune" limited time of ten minutes; this requires speed and proper machinery. All Engineers know how disastrous it is to work concrete too wet or too dry.

"FLEX-PLANE" mechanical joint installers for all types of joints—ribbon, premoulded, poured, cork, rubber, etc.

Ask for Bulletin E-11; it "portrays" other things you know!

**FLEXIBLE ROAD JOINT MACHINE COMPANY**

WARREN, OHIO, U. S. A.



## Two on the Aisle at the Beach-Head Bijou

The empty rope reels our fighting men sometimes use in their improvised theatres can mean but one thing . . . that our engineers are using plenty of tough, dependable wire rope in the operation of cranes, shovels, draglines and bulldozers.

Add to these demands the requirements of the industries providing supplies for our fighters, and it's easy to see that in spite of greater production there still isn't enough Wickwire Spencer Wire Rope to meet all demands.

To help conserve wire rope we

suggest that you send for copies of our book, "Know Your Ropes," which is packed with ideas to help make wire rope last longer. And, when you do need rope, get WISS-COLAY Preformed. It not only lasts longer than the non-preformed, but it's easier to cut, splice and install; it's kink-resistant and safer to handle.

If you have a particular wire rope problem our wire rope engineers will be happy to be of service. Write Wickwire Spencer Steel Company, 500 Fifth Ave., New York 18, N. Y.



### PROPER SHEAVE LOCATION LENGTHENS ROPE LIFE

Increasing the distance between the main sheave and the drum will reduce side wear of the rope. This and 39 other wire rope life savers; 78 "right and wrong" illustrations; 20 diagrams and charts—are all in our 82 page book, "Know Your Ropes."

SEND FOR YOUR FREE COPY

Send your wire rope questions to:



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STEEL COMPANY**

500 FIFTH AVENUE, NEW YORK 18, N. Y.



Abilene • Buffalo • Chattanooga • Chicago • Detroit • Houston • Los Angeles • Philadelphia • San Francisco • Tulsa • Worcester



## Close Records Kept In Compaction Tests

(Continued from page 43)

the loose thickness of the lift.

In order to obtain data relative to the uniformity of the embankment and the performance of the different types of compacting equipment, the following records were made during the construction of each section on both projects:

1. Type of roller used for compaction.
2. Maximum density and optimum moisture content of the material comprising each lift.
3. Number of lifts.
4. Loose thickness of each lift.
5. Moisture content of soil in each lift.
6. Amount of water added to fill material.
7. Number of trips with roller to obtain specified density.
8. Thickness of lift after compaction.
9. Density of compacted lift.
10. Moisture content of the compacted lift.

The following time studies were made to obtain information on the efficiency of the different rollers as indicated by the volume of material compacted per hour of rolling time:

1. Total available working time for section.
2. Actual working time of rollers.
3. Delays due to weather conditions, equipment repairs, waiting for material, and other operations.
4. Operating speed of rollers and other equipment.
5. Time required for various construction operations in connection with moisture control on section 1 of the Indiana project and on all sections of the Ohio project.

### Close Moisture Control Practicable

The average moisture content of seventeen of the twenty lifts in section 1 of the Indiana project was only 0.1 below the optimum for the material used. On one lift the average was 1.7 higher than the optimum. Although in a few instances the variation from the optimum was somewhat greater than the one specified, it is evident that the moisture control practiced on this section produced a high degree of uniformity in moisture content. Variations from the optimum were found to be greater on the other sections where the fill material was applied as it came from the borrow pit without regard to its moisture content.

It was not practicable on the Ohio project to keep the moisture content within the range of 1 of the optimum value. An attempt was made to maintain the moisture within the specified limits, but wider variations were permitted where satisfactory compaction was obtained and rigid control of the moisture content would have affected the progress of the work to such an extent as to be impracticable.

It is of interest to observe that on most of the work the compacted soil did not have a moisture content greater than the optimum. The number of lifts compacted at moisture contents below the optimum amounted to 92 per cent on nine test sections and varied from 74 per cent on section 4 to 97 per cent on section 3. This condition occurred in spite of the addition of water to all but a few of the lifts placed. The additional moisture was not sufficient, in most cases, to raise the moisture content to the optimum. The moisture content of the compacted lifts was influenced largely by weather conditions.

### Control Did Not Delay Work

One of the major delays in the con-

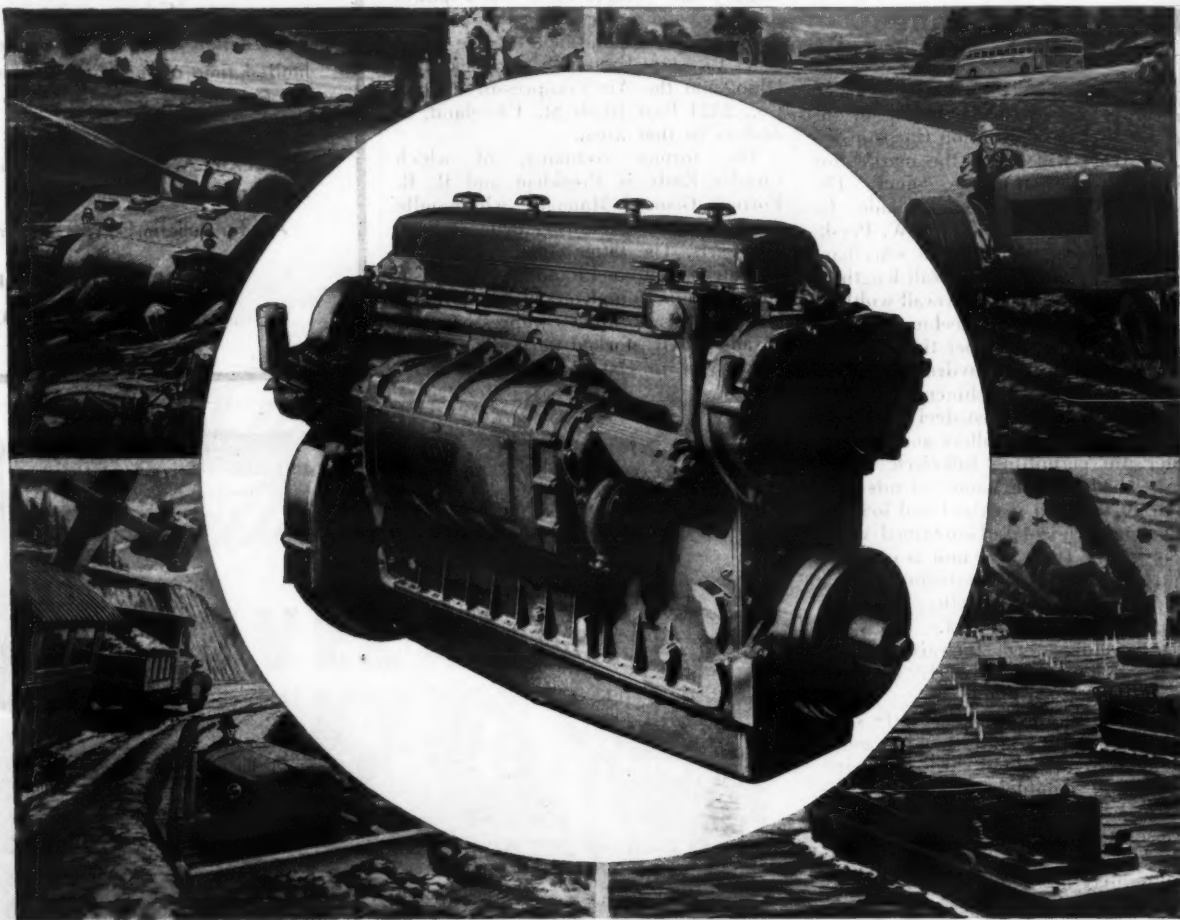
struction of fills on the Indiana project was waiting for material, due to an insufficient number of hauling units. Hauling operations were never delayed because of rolling. The time lost waiting for material was greater than the actual rolling time required to compact the fill. Each of the rollers readily compacted all of the material delivered to

the fill.

The Indiana hauling equipment was delayed on section 1 to correct the moisture content of the soil. Sprinkling of dry soil, drying of wet soil, and necessary disking resulted in an aggregate delay of 25.46 equipment hours. Addition of water by a distributor operating at a speed of about 3 feet per second

took an average of 25 minutes per lift although as much as an hour was required on some lifts. Mixing of the soil and water was done by a disk harrow which operated at an average speed of 200 feet per minute. The average time for disking was 35 minutes per lift, but this varied according to the width

(Continued on next page)



## GM DIESELS SERVE WHEREVER AMERICA NEEDS POWER

America's fighting Engineers and Seabees really work miracles. Sand dunes are leveled. Jungles are cleared. Landing strips appear overnight. Staggering loads are moved over land and sea.

Helping them work these miracles are General Motors Diesel engines.

Because these engines are rugged and dependable, they get the toughest kinds of jobs to do.

Because they take so little fuel, they

save precious transport space.

Because they have been designed for simplest maintenance, they stay on the job and keep on the go.

War is a tough proving ground for engines. It shows their mettle, reveals their stamina. As they perform their wartime tasks, these GM Diesels are proving the service they will continue to render in the many civilian needs for dependable, economical power after the war.

The Army-Navy "E" for efficiency in war production flies proudly over the GM Diesel plant in Detroit.

**KEEP AMERICA STRONG  
BUY WAR BONDS**



**DIESEL  
POWER**

ENGINES... 15 to 250 H. P. DETROIT DIESEL ENGINE DIVISION, Detroit 23, Mich.

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**La Crosse  
Heavy Duty Machinery  
Trailers**

For All Purposes



**LA CROSSE TRAILER &  
EQUIPMENT COMPANY**

LA CROSSE, WISCONSIN



Buy Bonds Regularly



**Avoid Waste in the  
USE OF PAPER!**

To Aid the WAR EFFORT—

- ☆ Every pound of paper must be used wisely.
- ☆ We must salvage paper normally thrown into the waste basket.
- ☆ Avoid waste. Salvage paper for military use.

**CALL A COLLECTOR!**





## Lifts Well Compacted By All Three Rollers

(Continued from preceding page)

of the lift and the amount of water added.

In only one instance in Indiana was it necessary to reduce the moisture content of the soil delivered to the fill prior to compaction. The soil was spread and left to dry with occasional disking to facilitate the drying. Six hours of intermittent drying and disking were required to process the soil in this manner. Delays resulting from the moisture control occurred only on the first six lifts on section 1. As the various operations of wetting and disking the fill material became more familiar to the construction crew, delays were avoided.

The actual number of hours that the rollers were in operation in Ohio was a small percentage of the time that they were on the job. Most of the time was consumed in waiting for material and for other operations in connection with hauling, spreading, disking and sprinkling. Construction work was never delayed because of the rolling. Each of the rollers readily compacted all of the material delivered to the fills.

It was necessary to add water to almost all lifts in Ohio in order to comply with specifications for moisture control. This was done by an 800-gallon pressure tank truck and two disk harrows. When moving at the rate of 250 feet per minute, the water was applied at the rate of 0.5 gallon per square yard. Two trips with a disk harrow operating at 200 feet per minute were generally required for mixing the water and soil. While these operations sometimes delayed the roller, they were not responsible for delays in hauling or spreading.

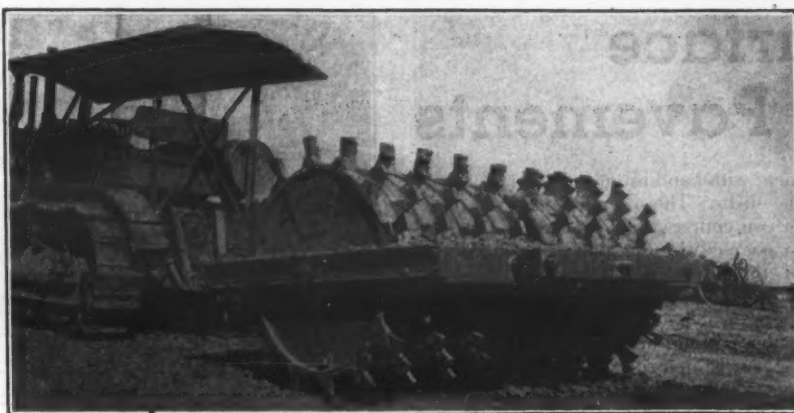
### Compaction Readily Obtained

The construction records show that the required compaction was obtained with all types of rollers. The average density and average number of trips by rollers of each type required to obtain compaction on both projects are shown in the table below:

Roller Type	Number of Trips		Maximum Density	
	Indiana	Ohio	Wet Density in Indiana Per Cent	Dry Density in Ohio Per Cent
Sheepsfoot	7.6	7.6	97.2	98.6
3-wheel	2.1	3.4	99.5	102.9
Pneumatic-tire	3.1	5.1	98.1	102.9

On the Indiana project the three-wheel and pneumatic-tire rollers gave equal compaction with the same effort, regardless of whether the loose thickness of the lift was 6, 9, or 12 inches. The data disclose also that variations in average moisture content of the soil of as much as 5.5 above the optimum, and more than 7 in a few instances, did not increase the amount of rolling necessary to obtain the specified density.

Extreme cases of eighteen trips with the sheepsfoot roller, five trips with the three-wheel roller, and twelve trips with the pneumatic-tire roller were recorded in Indiana. This occurred in only one instance with each type of roller and had little effect on the average value. As a matter of fact, the specified density was obtained with six or less trips on 69 per cent of the lifts compacted with



The Type B sheepsfoot roller used in the Ohio soil-compaction experiments.

the sheepsfoot roller, with eleven to thirteen trips on 24 per cent of the lifts, and with eight or nine trips on 5 per cent of the lifts. Likewise, two or less trips were required on 88 per cent of the lifts compacted by the three-wheel roller, and three or less trips on 88 per

cent of the lifts compacted by the pneumatic-tire roller.

Several tests were made on Indiana section 6 to determine if there was any difference in density between the upper and lower halves of a 12-inch lift compacted by a three-wheel 10-ton roller.

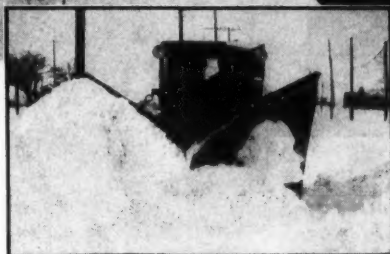
The results of these tests show that satisfactory compaction was produced throughout the entire thickness of the lift and that the lower half is likely to have a density equal to or greater than the upper half. The moisture content of the soils in this section ranged from 0.1 below to 4.7 above the optimum, and averaged 2.7 above the optimum. It has been observed that these relatively high moisture contents facilitate compaction of soils such as were found on this Indiana project.

In Ohio, with the three-wheel and pneumatic-tire rollers, slightly more rolling was necessary on the 9-inch than on the 6-inch lifts in order to obtain equal compaction.

Extreme cases of twenty trips with the sheepsfoot roller and eight trips with the three-wheel and pneumatic-tire rollers were recorded in Ohio. This occurred on only one lift in the case of the sheepsfoot roller and on three lifts with each of the other rollers. The construction records show that the specified den-

(Continued on page 76)

# CLEARED FOR TRAFFIC BEFORE BREAKFAST \*



Above is the smallest Case tractor with sidewalk plow. Inset is the largest size with moldboard type of highway plow, shown widening the way it has opened through deep drifts.

**A**LL but the people who sell spats are happy when a Case industrial tractor and plow take over the job of clearing snow from sidewalks. Householders relish their release from the snow shovel. Early birds get to work without wading. The perennial problem of vacant property is solved. \* \* Civic officials and heads of institutions . . . such as the New York State College of Forestry, where the larger picture was taken . . . like the low operating costs that come from the fast working speed, the easy handling and quick maneuvering which make man-hours more effective with Case industrial tractors. Investment cost is low, too, because the same versatile tractor handles a host of varied jobs throughout the year. \* \* Snow plows for Case tractors are built in blade, V, and moldboard styles to suit every need of street and walk, private drive and public highway. Curb-climbing attachments, hydraulic controls and other equipment are available to make these outfits the masters of any conditions. Ask your Case distributor or write for full information. J. I. Case Co., Racine, Wis.

### 5 EXTRAS IN EVERY CASE TRACTOR

Extra strength and stability to form the ideal foundation for mounted equipment. Extra ease of handling, all-day comfort for the operator. Extra convenience in fueling and lubrication. Extra care to exclude dirt, postpone wear, prolong tractor life. Extra endurance to see things through, cut down maintenance, reduce annual costs.



# CASE

## TRANSITS and LEVELS HEADQUARTERS for REPAIRS—any make

We will buy or trade in old Transits, Levels, Alidades, etc. Send instruments for valuation.

Write for new Catalog EC-911 of Engineering Instruments, Engineering Field Equipment and Drafting Room supplies.

**WARREN-KNIGHT CO.**

Mfrs. of Sterling Transits & Levels  
136 N. 12th St., Philadelphia 7, Pa.



# Black-Top Surface For Old Pavements

District 3 of N. Y. State  
Dept. of Public Works at  
Syracuse Paves 25 Miles  
Of Highways and Streets

† IN its road maintenance program of this year, District 3 of the New York State Department of Public Works, with headquarters at Syracuse, is resurfacing 25 miles of broken roads and village streets with asphaltic concrete mixed by the steam-dispersion process. This is a patented type of pavement employing a combination of stone of prescribed sizes and asphalt, together with a workability compound.

With no new highways under construction because of the war, the attention of New York State highway officials is devoted to maintaining existing roads. Emphasis has also been placed on keeping village streets in condition. Agreements are made between the State and the villages whereby the village raises manholes, or has the utilities concerned raise them, and also removes any unused trolley tracks. When this is done, the worn and broken pavement is then covered with a smooth black-top asphaltic surface. The resurfacing is done entirely by state maintenance forces, with the bituminous concrete supplied and delivered to the job site by contract.

## Project in Palmyra

A mile-long section was recently completed through the village of Palmyra, in Wayne County, famed as the birthplace of the Mormon religion. A 6-inch concrete pavement varying in width from 30 to 85 feet had been laid in 1923. During its 20-year life, a considerable amount of cracking and scaling had developed. Six years ago the double trolley tracks running down the center of the street were covered with a plant-mix asphaltic concrete 1½ inches thick for a 19-foot width.

The first step in the present resurfacing was the raising of twelve manholes by the village to conform with the grade of the new paving. Then a crew of ten state maintenance men with Paul Mau, General Maintenance Foreman in charge, cleaned the old concrete pave-

ment with hand brooms, especially along the curbs. The plant-mix was put down in two courses, base and top. The base or coarse mix was placed on either side of the center panel which covers the old trolley tracks. It was laid 2 inches loose, which compacted to 1½ inches under rolling, and was feathered off at the curbs in order to maintain a uniform thickness of top.

The plant-mix was bought from and delivered by the General Crushed Stone Co. at Oaks Corners, N. Y., in five International steel-bodied trucks each holding 9 tons, or four 2¼-ton batches. It is a 20-mile haul from Oaks Corners to the village but the mix was delivered at about 180 degrees F. The paving was done in 10-foot strips by an Adnun Black Top Paver rented from the Salina



New York State Department of Public Works Photos

An old brick pavement on New York State Routes 5 and 20 through the village of Seneca Falls (at left) was resurfaced with a semi-hot-mix as part of District 3's 1944 maintenance program.

Construction Co. of Syracuse, N. Y. The rakes and shovels of the paving crew were kept clean of material by a kerosene blow torch mounted on a small two-wheel cart which was pushed along and kept near the paver.

The mix was compacted by rolling with a Hercules 3-wheel 10-ton roller and a Galion 5-ton portable roller with one steel wheel and two rubber-tired wheels. A 500-gallon water tank mounted (Concluded on page 85)

This might have  
been your NEW  
shovel, but . . .



Your present equipment,  
working 'round-the-clock will  
last longer and continue to per-  
form efficiently if these com-  
mon-sense rules are followed:

- insure proper regular lubrication
- provide daily inspection to detect troubles while they are still small
- make adjustments when needed—don't wait
- tighten loose bolts and nuts
- keep fuel, lubricants and water clean
- remove clutch and brake bands and clean lining with good grade of clear gasoline
- change cables end-for-end to increase life of wire rope
- plan work to favor machine
- inspect engine regularly — flush radiator when dirty
- always give model and serial numbers when ordering repairs
- contact your BAY CITY distributor for parts and service.

here again BAY CITY helps build  
an airfield in the South Pacific . .

Modern excavating and material handling equipment is playing an important part in forwarding the attack on fighting fronts all over the world. Just as this BAY CITY is loading coral for an airfield in the South Pacific, your new equipment has gone to war. And because there will be no new machine production released for civilian needs for the next 12 months or more, it is important that present equipment be kept in good operating condition. Look over the few simple, common-sense rules of maintenance that will lengthen the life of your shovel, dragline or crane. Apply these rules regularly. And if you are making plans for postwar equipment needs, write for literature on the fast, powerful, easy-handling BAY CITY which will some day be available with crawler or pneumatic tire mounting. BAY CITY SHOVELS, Inc., Bay City, Michigan.



# BAY CITY

SHOVELS • CRANES • DRAGLINES • TRENCH HOES • TRIMMERS

## YOUR INSURANCE



ROSS SNOW FLOWS are your insurance against snow blocked roads and traffic tieups during the coming winter. Plows for all trucks and tractors and for all plowing conditions.

Ask us for circular of the new power lift for plows only. You will be surprised at the small cost for this new and better power lift.

Ross snow plows and parts  
are manufactured by

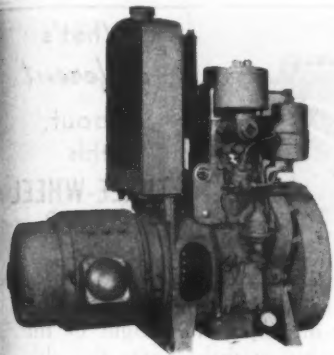
**THE BURCH CORPORATION**

Crestline, Ohio

Equipment since 1873

**Help Finish the War  
Buy More Bonds**





One of the new Marvel diesel electric plants.

## Line of Electric Plants In 350 to 25,000 Watts

Marvel diesel electric plants, offered by Marvel Equipment Manufacturers, Inc., 224 So. Michigan Ave., Chicago 4, Ill., are built in a variety of sizes, with direct and belt-connected generators. Combining Marvel generators with well known diesel engines, the manufacturer states that the result is a balanced combination with a long service life free from service difficulties.

Marvel gasoline-powered plants are available in capacities from 350 to 25,000 watts. The generators are fully streamlined and are reported to produce a greater output in watts per pound of weight, because of the use of a rolled steel casting for the outer casing instead of the more common cast iron shell. The brushes, dc commutator, and ac collector rings are mounted on a separate cast ring located at the front of the generator, and are immediately and easily accessible merely by removing the front-end bell.

Particular attention has been given to the cooling system, to provide cool-running performance. The fan is located in front, and pushes cool air through the generator rather than pulling warm air from behind the windings.

Further information on the line of Marvel diesel electric plants in capacities of 3, 5, 7½ and 10 kw for providing electric power on the job, may be secured direct from the manufacturer. Just mention this item.

## The Treadway Bridge For Stream Crossings

Civilian engineers have followed closely all of the developments of the Corps of Engineers, U. S. Army, feeling that some of these developments for war use may be put to good service later in civilian engineering activities. Among these is the steel treadway bridge, M2, used by the Engineers to accomplish rapid stream crossings for all vehicles except a few of the largest and heaviest. It may be constructed on either floating or fixed supports, or a combination of both.

The bridge roadway consists of two continuous tracks or treadways formed of steel channels, rigidly connected by steel pins at the joints. The floating spans are supported on pneumatic pontoons spaced 12 feet center to center, and the fixed spans are supported on prefabricated adjustable steel trestles. Each of the parallel steel treadways has

a clear width of 45½ inches and is made up of 12-foot units. The steel channel beams, braced by cross beams, are locked to the float saddles.

The pneumatic floats used for the bridge are made of inflated rubberized canvas tubes 8 feet 3 inches wide, 33 feet long, and 33 inches in diameter. Each float weighs approximately 975 pounds, and the deflated float is packed into a carrying case 4 feet long and 3 feet 9 inches in diameter. Each float is equipped with a saddle of steel beams and plates, to which the treadways are locked, which transmits the load to the float and which ties the structure together.

An Engineer treadway-bridge company carries enough equipment to build an 864-foot bridge, transported in special treadway-bridge trucks and in fourteen 2½-ton cargo trucks. The bridge truck is a specially-designed 6-ton vehicle equipped with a power crane, used to handle the heavier units of the bridge. Power boats, out-board motors, air compressors, diving equipment and



U. S. Army Signal Corps Photo

The steel treadway bridge is speedily erected by U. S. Army Engineers.

other matériel are also carried by the company, which can build an entire bridge in about five hours of daylight.

## Etnyre Dealer Meeting

The dealer organization of E. D. Etnyre & Co., maker of Black Topper bituminous distributors, street flushers and similar equipment, met in Oregon, Ill., the company's headquarters, for four

days of meetings, beginning October 4. The purpose of the convention was to outline post-war marketing policies and to display new developments in Etnyre products. In addition to the business sessions, various entertainments were held. Dealers from twenty-one states, Washington, D. C., and Toronto, Canada, attended the meeting. Present also were a number of guests from the highway construction field.



**NEW FEATURES...STARTLING PERFORMANCE  
ABILITY TO "TAKE IT"...MORE PORTABLE  
FASTER MIXING!**

They're "go getters" when it comes to pouring yardage, durability and speedy portability. You can expect great IMPROVEMENTS in CMC post-war Mixers and you won't be disappointed.

More than a third of a century of "know how" plus a top record in building Mixers for Uncle Sam in the war years combine to bring you the kind of equipment you will need to handle the mass of POST-WAR WORK THAT'S WAITING. These new CMC's will come in all standard sizes.

GET ADVANCE INFORMATION NOW!



**CONSTRUCTION MACHINERY CO.  
WATERLOO • IOWA**

*Watch*



*For the Latest in*

**PUMPS . . MIXERS . . CON-  
CRETE GUNS . . BATCHING  
AND PLACING EQUIPMENT  
.. HOISTS .. POWER SAWS  
.. CARTS AND BARROWS!**

For  
68 Years  
Builders of Fine  
**WHEEL BARROWS:**  
**AMERICAN**  
STEEL SCRAPER CO.  
Sidney, Ohio  
Watch for  
Post-War  
Models



# Mass. Shops Set Up In Old State Armory

(Continued from page 46)

record.

On the wall of the office is a repair progress chart with the days of the months shown on a top horizontal line, and the sequence of repair operations listed vertically at the left. A glance at this chart shows what stage a truck, for instance, has reached in its repair operations. Twenty-nine items make up this vertical listing. They are:

1. "S" Registration Number
2. Job Number
3. Make
4. Model
5. In shop
6. Received complete
7. Waiting for steam cleaning
8. Steam cleaned
9. Waiting for test
10. Tested
11. Approved
12. Being repaired
13. Waiting for grease
14. Greased
15. Test with mechanic
16. Road test
17. Final repairs
18. Final road test
19. Waiting for steam cleaning
20. Steam cleaned
21. Sand blasted
22. Waiting for paint
23. Being painted
24. Paint drying
25. Waiting for delivery
26. Notify district
27. Delivered
28. Mechanic's name
29. Helper's name

## A Trip Around the Shop

When started on its way by the tester, the equipment may be sent to any specified section of the shop. Each particular area doing a certain type of repair work has its location clearly marked on the floor by 4-inch stripes of white paint. Proceeding in a clockwise direction and immediately to the left of the main entrance, one finds the machinery and tractor repair department. Against the wall are four work benches, 15 feet long, 3 feet wide and 3 feet high, made of wood with metal tops. Like most of the other shop furnishings, these benches were made by the Department. Each bench has a vise, two extension lights, four outlet boxes, an air hose and a reel light, together with a complement of machinist's tools. The Department owns twenty-three 5 to 10-ton tractors, including eight Holt, ten Best, one Mead-Morrison, and four Monarch models. These are hooked up with plows and bulldozers as required.

The previous shop had a monorail with a hand-operated crane for the easy handling of heavy pieces. The reconverted Armory has no such equipment, but an Elwell-Parker 5-ton portable electric crane mounted on a 4-wheel-steer chassis does the necessary lifting smoothly and quickly. The crane has a 19-foot boom which will lift 1½ tons at its maximum reach, and will lift 5 tons when 5 feet from the body. The boom can make almost a complete circle in its swing. Power comes from a 1-ton battery which is charged every night in about 4 hours on an Exide charger.

Motor work is done in the northwest corner of the shop. Clutches are also repaired here, with the clutch assemblies being kept in wooden boxes, 18 inches square and 6 inches deep, so parts cannot be mislaid. The stock room has clearly marked these boxes with manufacturers' numbers for easy identification.

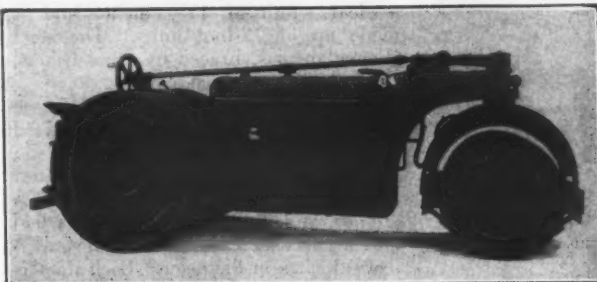
Along the north and east walls trucks are repaired. White lines are painted stagger fashion on the floor to indicate the position a truck must take so that the portable crane has easy access for its hoisting. Nine work benches, similar to those in the machinery repair section, line the walls. Every fourth bench has a grinder, and centrally located is a large 5-hp grinder. A Rex Degreaser cleans the truck parts by vapor. The Department's one hundred and thirty-eight 4-wheel-drive trucks are maintained here. That includes sixty-one FWD's, sixty-eight Walters, two Cole-

mans, and seven Autocars. Each is equipped with a V-plow, center scraper plow, an auxiliary plow, two extra sets of plow blades and bolts, and a sand spreader. No standard makes of Department automobiles are repaired in this shop, as it is believed to be more economical to have this work done at authorized service stations.

## Shop-Made Receptacles

Two interesting receptacles made by the shop are located in this area. The first is a metal box for scrap-metal collection, 6 feet long x 3 feet wide x 3 feet high, with a self-dumping swivel. When full, the box is picked up by the crane and dumped into a truck which piles the scrap in the yard to be removed later. The other receptacle is a metal waste-oil tank of 500-gallon capacity, 10 feet long x 3 feet wide x 3 feet deep, with a bottom drain. The crane places the tank, when filled, on a truck which hauls it out in the storage yard. The waste oil is then pumped out and sprayed around

(Continued on next page)



What's  
different  
about  
this  
**THREE-WHEEL  
ROLLER**  
?

The wheels (rolls) are cast hollow and are fitted with portholes so they can be filled with water or sand—thus increasing the weight of the roller to produce more ground pressure when needed—a very desirable feature.

*Variable Weight—that's the answer!*

Other important features are its ruggedness, its easy steering, its clear vision, and operator-comfort.

FOUR SIZES: 4-5 ton, 5-8 ton, 8-10 ton, 10-12 ton. WRITE FOR LITERATURE.

Manufactured by  
**J. E. INGRAM EQUIPMENT CO.,** 1146 W. Laurel St., San Antonio 6, Texas



# WINNING COMBINATION for POSTWAR PLANS

In your plans for postwar expansion, don't overlook this winning combination—Smith Tilting Mixers for pre-mixing or pre-shrinking concrete, and Smith-Mobile Agitators for delivering the pre-mixed or pre-shrunk concrete to the job. Both machines are PROFIT MAKERS with a record of performance that has never been equaled. Their maintenance cost is almost negligible. Write today for descriptive literature.

**The T. L. SMITH COMPANY**  
2857 N. 32nd Street, Milwaukee 10, Wisconsin, U. S. A.

Equipment  
You'll be Proud  
to Own

## SMITH TILTING MIXERS

Famous all over the world for their fast charging, thorough "end-to-end" mixing and fast tilt and pour discharge. Ideal for central mixing plants because of low maintenance costs and rugged dependability, even when worked night and day. 4 sizes—from 1 to 4 cu. yds.

## SMITH-MOBILE AGITATORS

Fast loading, smooth agitating, effective mixing and HIGH discharge. Fast pouring or slow controlled discharge, as desired. Large radius of spout distribution. Practically trouble-proof.



# SMITH-MOBILE





C. &amp; E. M. Photo

The 5-ton portable electric crane on a four-wheel-steer chassis which takes the place of an overhead crane in the temporary Central Equipment Shops of the Massachusetts Department of Public Works.

and motor are fastened to a bench, 8 feet long x 4 feet wide x 3 feet high, mounted on four 8-inch Colson rubber casters. This portable unit can be pushed around to any desired location where hydraulic controls are to be tested. When plugged in to any three-way electric socket the machine is ready for operation.

The Department has also developed a battery tester for checking storage batteries purchased by contract. The usual SAE test of freezing a battery to 0 degrees F for 24 hours is done, but the results are recorded on a machine that uses bulbs to measure the resistance, instead of the usual resistance coils which are apt to show a variation when overheated. As the voltage drops, more bulbs can be turned on to increase the amperage, thus maintaining a constant voltage. Recording graphs show the results of tests either on a minute or 24-hour basis.

#### Spraying Metal

A useful machine in many ways is a compact little instrument called a Mogul Metallizer. It sprays any metal from

No. 10 to No. 80 carbon steel with the ease of a paint spraying machine. Worn motor shafts can be built up quickly and evenly in this manner. Another use is the spraying of zinc on metal parts for the prevention of rust, which is an improvement on painting. For this machine, the shop has rigged up a portable steel platform, 6 feet long x 3 feet wide, mounted on four 1-foot-diameter steel wheels with rubber rims. Occupying

one end of the platform is a steel cabinet with several shelves containing the varied reels of metal wire used in the spraying. A tank of oxygen and a tank of acetylene are at the other end, together with a hose to be attached to a compressed-air outlet. The operation is simple. The wire is fed through the Metallizer on a small gear; the oxygen and acetylene reduce the metal to a

(Concluded on page 84)

## PLACE ORDERS EARLY

for DAVENPORT-FRINK SNO-PLOWS



Because of the necessity of clearing all Sno-Plow orders through Washington, we URGE the EARLY placement of orders for new Davenport-Frink Sno-Plovers. Also we ask the early submission of repair part specifications to insure delivery BEFORE the snows come.

**DAVENPORT BESLER CORPORATION**

Dept. A  
DAVENPORT, IOWA

Made in Eastern U.S.A. by CARL H. FRINK, 1000 Islands, CLAYTON, NEW YORK

## Machine Care Keeps Road Units in Service

(Continued from preceding page)

the ground with a hose to help settle the dust.

In the welding department in the center of the east wall two men are trying to keep up the work formerly done by five. It has been impossible to get replacements for the three in the armed forces. There are five electric welding machines and three of the acetylene type. Also located here are a sand blaster, a grinder, and a cutting table.

The tire shop is equipped with a Keweenaw tire machine operated by compressed air. This opens up and spreads the casing either for inspection or for the placing of the inner tube. A tire safety rack, 5 feet long x 2 feet wide x 4 feet high, has prevented many accidents. Made of 1½-inch pipe with rail fittings, it will accommodate up to a 14:00 x 24 tire. The tire on the rim is inflated within this tubular cage so if the rim flies off no damage will be done. To repair chains, a Pyrene tire-chain machine working with compressed air is used.

A big air compressor is an indispensable piece of equipment. Air, at a pressure of 125 to 150 pounds per square inch, is used for inflating tires, spraying paint, the metal sprayer, pneumatic tools, hammers, wrenches, hoists, grinders, chippers, sand blasting, repairing chains, etc. A fully automatic two-stage Sullivan air compressor driven by a 50-hp electric motor delivers 435 cubic feet of air to a storage cylinder 20 feet long and 6 feet in diameter. Air is piped around the shop in many different lines so that an individual break-down cannot tie up the system. Each bench has an air outlet with push-and-turn attachments for blowing and cleaning parts.

#### Machine Shop

Against the south wall is the machine and tool room equipped with a Beaver pipe and bolt threading machine with automatic die heads, a Manley 70-ton hydraulic press for bushings, a Kwik-Way valve machine for grinding and re-seating valves, two spindle drills, one upright Champion drill and an 18-inch x 4-foot Lehmann lathe. The drills and lathe are driven by a 15-hp electric motor which also drives a shaft going through the side wall into the paint shop, thereby mixing paint by the same motive power.

Another Department-made device is a hydraulic test bench operated by a 5-hp electric motor. Leaks may be detected in steering rams, lifting-device rams, plow controls, pumps, etc., up to 1,000 pounds pressure. The cylinder gages

### GOING TO NEED A HOIST?

Then you'll want the best hoist on the market . . . a hoist that is built of the finest materials; that has precision workmanship throughout and that is founded on practical, common sense engineering principles.

Clyde Hoists are just that type of equipment . . . made to meet the demands of leading building contractors . . . for the best in equipment means the most in production.

You have your choice of gasoline, Diesel, electric or steam power; one, two or three drums in a range of sizes to fit every job.

*Plan now for the job you'll do tomorrow*

Send for a special bulletin on any type of Clyde equipment. Complete description and specifications.

**CLYDE**

DULUTH, 1

**IRON**

MINNESOTA

**WORKS, INC.**

MINNESOTA





Earth for Des Moines' new emergency reservoir was moved by Tournapulls and Carryalls. Right, regular servicing of this fleet of equipment by Peter Kiewit Sons' Co., contractor for the project, kept the dirt moving on schedule.

## Emergency Reservoir Is Dirt-Moving Job

When the city of Des Moines, Iowa, faced a water shortage, it was decided to construct an emergency water reservoir and pump water into it from the Raccoon River, and a contract was awarded for moving some 600,000 cubic yards of dirt to form the reservoir close by the city. Work was started on June 15, 1944, and finished early this autumn by Peter Kiewit Sons' Co. of Omaha, Nebr. The prime earth-moving task included the construction of a dam about 80 feet high and 1,800 feet long plus the earth-moving finishing work, grading and similar clean-up activities. The contractor used three Super C Tournapulls and three LeTourneau Carryall tractor-drawn scrapers, two LeTourneau bulldozers, and a LeTourneau Rooter. The material, a moist sand clay, was hauled approximately 1,500 feet to the site of the dam.

The rubber-tired Tournapulls operated at normal traffic speeds both off the road and on the road during hauling, and were driven to the site of the Des Moines job from a previous job at Colfax, Iowa, 40 miles away. On the job, the Tournapulls averaged 9.1 trips per 50-minute hour, which is average operating efficiency for contractors. Figuring 12 pay yards per load, the contractor realized 120 pay yards of dirt moved per hour.

## Compressed Concrete Substitute for Steel

Northwestern University has announced the development of a building column of compressed concrete reinforced with a small amount of steel which tests indicate is an improvement over

all-steel structural columns. The column was designed by Professor George A. Maney, Chairman of the Department of Civil Engineering, whose research has been carried on under the War Production Board's program to discover new materials and designs to reduce the use of scarce materials. The new type of column is reported to be stronger and cheaper than a steel column and as light

as aluminum.

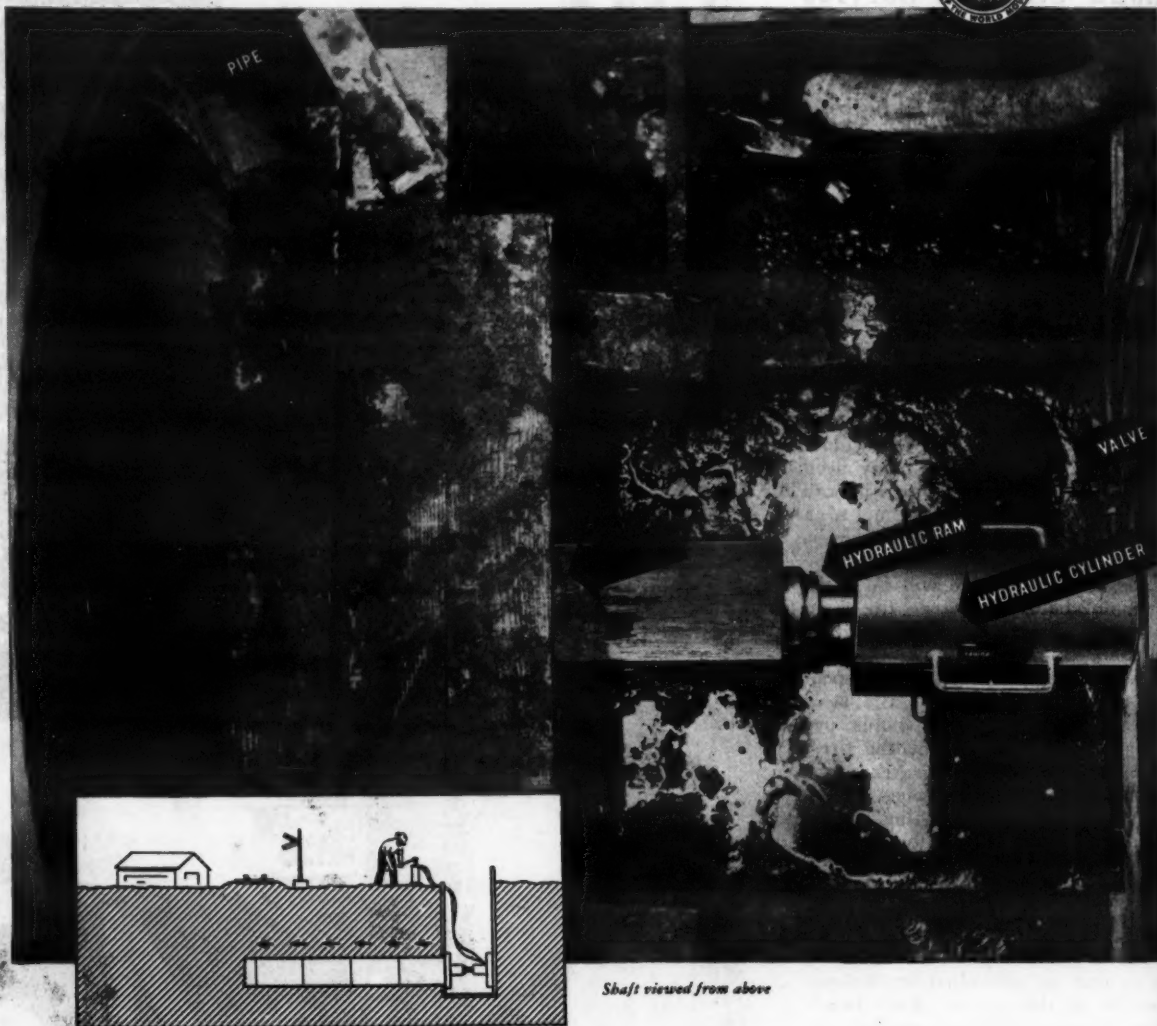
The column, for use in the construction of buildings, bridges, and special foundations, consists of highly compressed concrete encased in a spiral of steel wire. It is estimated that it can be produced at about one-third the cost of a steel column. In the manufacture of the compressed concrete, which is stronger than any concrete produced heretofore,

only one gallon of water per sack of cement is used compared to five to eight gallons in ordinary concrete. The reduction of water is made possible through a special method of compaction which includes vibrating the concrete while it is damp.

Morris Lagaard, Assistant Professor of Civil Engineering, conducted tests on the new material and has designed a proposed plan for mass production. One test model of a column, which in actual construction will be 8 to 10 feet long, is 1 foot long and about 5 inches in diameter. This concrete core withstood 83,000 pounds pressure per square inch, compared to the 60,000-pounds maximum of a solid steel column of identical size.

Expenditures for repair and maintenance of existing construction will amount to nearly \$25,000,000,000 during the first six months after the war, with improvements to public utility systems and highways accounting for nearly half of the total, according to The Producers' Council.

NO. 21 OF A "READY-WITH-A-RODGERS" SERIES



## "DRIVING PIPE FOR THIS STORM SEWER WAS DUCK SOUP WITH OUR RODGERS UNIVERSAL"

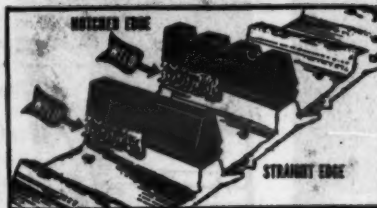
"We had to go under a freight house and railroad tracks, pushing 6-foot concrete tile through sand for 40 feet. But our Rodgers Universal Press handled it slick as a whistle... at 1/10 of what it would have cost without your equipment."

"Headed by a steel bonnet, the tile was inched through without a hitch. And it was a big help to pump that 150-ton pressure from the surface, instead of a cramped space 16 feet underground."

This was reported by a Wisconsin municipality. The all-purpose Rodgers Universal Press saved them both time and money. It can do the same for you. For complete information and prices, write or wire Rodgers Hydraulic, Inc., Dept. A-11, St. Louis Park, Minneapolis 16, Minnesota.

If it's a Rodgers it's the Best in Hydraulics

Uses for the RODGERS UNIVERSAL HYDRAULIC PRESS: Gear Pulling • Wheel Press Work • Jacking Pipe • Erecting Machinery • Relocating Machinery • All-Purpose Jack



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**RODGERS HYDRAULIC, Inc.**



## Effect of Lighting On Drivers' Habits

### Tests Made on Lighted and Unlighted Sections of New Jersey Route 43 to Determine Post-War Lighting Program

IN order to determine just how automobile drivers act on lighted highways and unlighted highways, so that consideration can be given to the installation of lighting on important highways after the war, the Electrical Division of the New Jersey State Highway Department and the Public Roads Administration conducted a series of tests during the Labor Day week-end under the sponsorship of the Committee on Highway Lighting Research of the Highway Research Board.

A 5-mile section of the White Horse Pike, New Jersey 43, near Absecon, N. J., was used as a laboratory for obtaining data regarding the value of lighting rural highways. The Atlantic City Electric Co. placed lights on 2.5 miles of a 5-mile section and operated them from August 30 through September 6 so that the studies could be conducted under actual highway and traffic conditions.

The tests consisted of two separate, yet related, studies. During one study, the speed, transverse position on the highway, and the distances to other vehicles traveling in the same and opposing directions were recorded for each vehicle as it passed a point on the unlighted section of the highway and again as it passed a point on the lighted section. By employing special electrical equipment developed and constructed by the Public Roads Administration, this information was recorded automatically, unknown to the drivers, for all vehicles during both light and heavy traffic volumes for several hours in the daytime and at night from September 1 through September 4 (Labor Day). The equipment used included small detectors which were placed across the surface of the highway at each study location and a station wagon containing the speedometers and recording apparatus which was located well off the highway.

The road detector consists of two small rubber tubes 24 feet apart and a placement detector 1/2 inch high and 2 inches wide with separate contacts each foot across the three-lane concrete surface and 8-foot bituminous shoulder. Each of the rubber tubes is in three sections, each section being connected to a separate pneumatic switch so that separate electrical impulses are received for each traffic lane as a vehicle crosses the first detector and again as the vehicle crosses the second detector. These electrical impulses start and stop one of three speedometers which automatically records the speed of the vehicles on the proper graphic time recorder, depending on the traffic lane in which the vehicle is traveling. Three speedometers and three graphic recorders were used for this operation in New Jersey so that speeds of all vehicles on the three-lane highway could be obtained. The transverse position of each vehicle on the highway was recorded to the nearest 1/2 foot on two other graphic time recorders having a total of five 20-pen instruments coupled together in one truck at each of the two study locations.

By analyzing the records, it will be possible to compare driver behavior at night on the lighted and unlighted sections with the normal daytime driving for such characteristics as:

1. Travel speed.
2. Position on the highway at different speeds.
3. Clearance between meeting vehicles traveling at various speeds.
4. Transverse and longitudinal spacings between vehicles at different traffic speeds.

### Driver Reaction

The second phase of these studies consisted of obtaining data regarding the nervous tension of drivers and passengers while traveling over the highway in the daytime, at night on the unlighted highway, and at night on the lighted highway. A car equipped with a number of special recording devices was used for the first time during the New Jersey studies. It appears to be a normal five-passenger sedan to the test drivers and passengers but in back of the front seat are located the devices used to record the reading of a number of well concealed instruments for obtaining the nervous tension of the driver and a passenger in the front seat. Included in the recordings of the New Jersey tests was such information as the movement of the steering wheel, the pressure or grip of the driver on the steering wheel, the movement of the accelerator, the speed of the vehicle, the pressure of the driver and passenger on the back of the front seat, and the change in the pressure which the passenger exerted on a small

rubber bulb that he held in his right hand.

A total of thirty-nine round trips or test runs was made during daylight and darkness over the 5-mile test section by drivers and passengers from Absecon, N. J., who were not familiar with the type of information being obtained but who were willing to spend their time in order that the difference in driving conditions on heavily traveled rural high-

ways that are lighted and unlighted may be correctly evaluated for design engineers who are now considering post-war construction.

The New Jersey tests were conducted under the direction of James L. Hays, Chief, Electrical Department, New Jersey State Highway Department, who is a member of the Committee on Highway Lighting Research of the Highway Research Board.

## SPEED OPERATION for Snow Plows and Road Machinery with the . . .

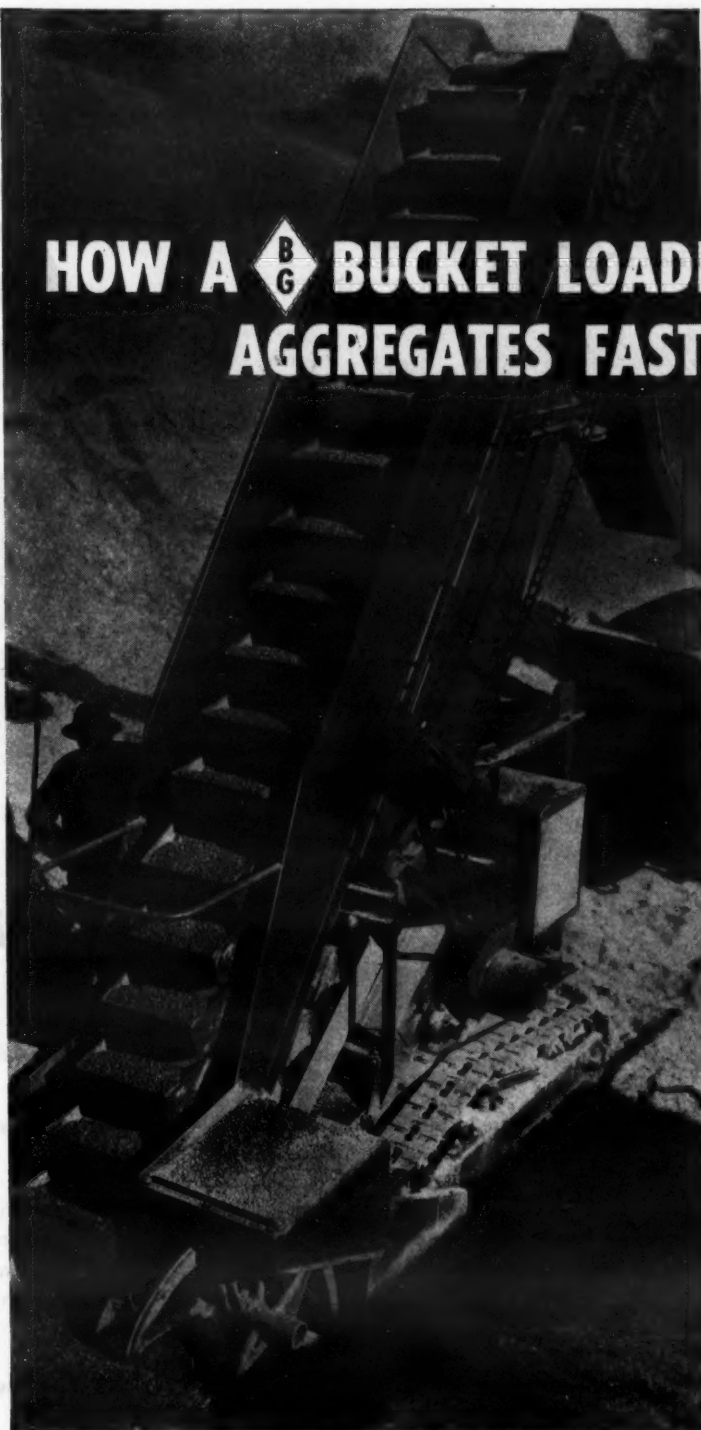
### MONARCH Hy-Rocket Power Hydraulic Control



- Lifts plows ten times faster than hand pump.
- Fan-belt driven by truck engine. Cab-controlled.
- Easy installation on new or existing equipment.
- Priced for the most conservative budget.

MONARCH ROAD MACHINERY COMPANY, 327-329 Front Ave., N.W., Grand Rapids 4, Michigan

## HOW A B-G BUCKET LOADER HELPS HANDLE AGGREGATES FASTER AND CHEAPER



**T**HIS versatile Barber-Greene Bucket Loader is a valuable job-coordinating unit in pit and quarry.

You can save money by processing aggregate at a uniform rate, even during "off" seasons, and storing it in stockpiles.

A Barber-Greene will reload it into trucks, whenever needed, at exceptionally low cost. In fact, many operators have found that the saving in truck time alone justifies its purchase.

Continuous handling by the B-G Loader is extremely advantageous in feeding material to processing equipment — screens, crushers, belt conveyors.

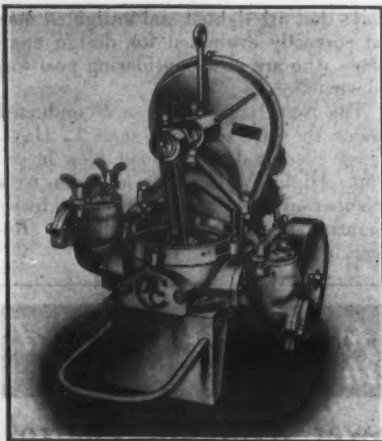
The B-G Bucket Loader also can be used for stripping, light excavating, screening, and many other cost-saving applications.

Full crawler mounting, tank type chassis, automatic overload release, synchronized spiral feeding, floating boom, centralized control, and 12 crowding speeds are but a few of the advanced mechanical features that give the B-G Loader long life and fine performance under the rigors of heavy, steady work. Consult your B-G representative or write the Barber-Greene Company, Aurora, Illinois.

# BARBER-GREENE

AURORA, ILL., U.S.A.





A CMC pump with ball valves.

### Diaphragm Pumps With Ball Valves

There are many times when a diaphragm pump will not operate satisfactorily in removing water from trenches, low cofferdams, and other enclosed areas, because there is too much dirt or heavy organic matter, such as sludge, in the liquid. To avoid this difficulty, the Construction Machinery Co., Waterloo, Iowa, is now making ball valves optional equipment for the 3-inch and 4-inch sizes of CMC diaphragm pumps which are 100 per cent self-priming.

Complete information regarding these pumps and their ball-valve feature may be secured direct from CMC.

### A Double-Duty Oil To Protect Engines

A new motor oil designed for heavy-duty service in internal-combustion engines of both gasoline and diesel-fuel types has been announced by Sta-Vis Oil Co., 184 Eagle St., St. Paul, Minn. Many gasoline and diesel-engine operators are troubled by heavy engine deposits, varnished pistons, stuck or clogged rings, and excessive sludging. This new double-duty oil overcomes these troubles because it loosens old deposits in the engines and acts to prevent sticking rings, and sludge and varnish formation, it is stated.

Sta-Vis DD is a specially refined lubricant made from high-grade crude and has an effective detergent action, according to its producer. This detergent action involves a cleansing or purging of deposits, such as carbon, sludge, varnish, and other harmful by-products of combustion that accumulate in an engine, and the dispersion of these deposits as minute particles which are carried away in the oil instead of lodging in the engine.

It is claimed that this oil will last and lubricate much longer than straight mineral oil. Service and engine tests made by the manufacturer show that its stabilized viscosity keeps the oil in better condition and, in turn, provides cleaner engines and prevents bearing corrosion as Sta-Vis DD is non-corrosive.

A 32-page booklet on these motor oils has been prepared by the producer to answer lubrication questions, with specific reference to its product. Copies of the booklet will be sent promptly to those writing direct to the producer and mentioning this item.

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Telephone-Murray NII 3-3088

Dallas, Texas  
Magnolia Building

### Truscon Steel Names Plant Works Manager

Peter Robertson has been appointed Works Manager of the Youngstown plant of the Truscon Steel Co., a subsidiary of the Republic Steel Corp. Mr. Robertson, a native of Glasgow, Scotland, has been associated with Republic since 1934 and was Assistant Chief Industrial Engineer for the past two years.

### Mercer Rejoins Robins

After two years of service with the War Production Board, as Chief of the Conveyor and Mechanical Power Transmission Equipment Section, Material Handling Division, William B. Mercer has returned to Robins Conveyors Inc. of Passaic, N. J. Mr. Mercer will be located in the Boston office of the company where he will resume the handling of sales of materials-handling machinery, sharing the New England territory with J. F. Donahue, who is in charge of the Mead-Morrison Division sales.



### Cartwright 'HOT SPRAY BAR'

Applies heaviest Tar and Asphalt without use of torch or flushing bar into ditch. The spray is started and cut off instantly with *no drip*.

#### AIR CONTROL

The feature of this control is that the spray can be started on an exact line automatically from the cab.

#### The Cartwright FIFTH-WHEEL GOVERNOR

automatically synchronizes pump RPM with truck speed. Provides accurate distribution.

For further information write

The CARTWRIGHT ASPHALT EQUIPMENT CO., Inc., Galion, Ohio



# ALWAYS READY...



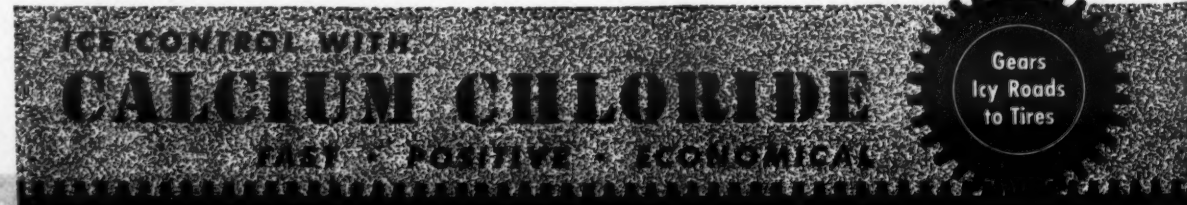
An unprepared, unprotected transport in submarine-infested waters would be in for trouble. When roads get icy, highway service crews are in for trouble, too, if untreated stockpiles are frozen — hard to load — hard to spread — slow to act on ice.

Every year more officials stock up early on ice control abrasives, treat them with calcium chloride and cover or store them in sheltered bins. Thus they are "Always Ready" when ice forms, to get quick coverage of fast acting, easy to load, easy to spread abrasives.

Abrasives treated with calcium chloride quickly dig into ice, hold fast and give traction. Such real service to traffic may be supplied with substantial savings in materials, labor and time if you'll use calcium chloride in your ice control grits.

Write for our Bulletin No. 27, "Skidproofing Icy Roads and Streets." It will be sent on request.

**CALCIUM CHLORIDE ASSOCIATION**  
4145 Penobscot Building • Detroit 26, Michigan





# Timber Bridge

(Continued from page 61)

piers. Gas-pipe casing was set over each pile location and a 12-inch churn drill was operated inside it to drill holes 6 feet into the shale while the 15-inch casing excluded stream gravel from the hole. Driving the piles through the casing was attempted at first but proved impractical because of the difficulty of removing it after the piles were seated. So a small dam was built by the drag-line, just upstream from the pier site, the casings removed, and the eleven piles inserted immediately into the drilled holes before the dam gave way, after which they were driven sufficiently to assure a firm seating.

## Truss Erection

Lumber of all stress grades was under severe restrictions at the time the project was built, but the required amount for this bridge was released to the Public Roads Administration who in turn authorized the State Highway Department to receive it. Therefore, it was necessary for the State to secure all lumber for the superstructure, above the pile cut-off line, supplying it to the contractor who bid to unload, haul, and erect it. Lumber below the pile cut-off line, not being of stress grade, was furnished by the contractor. By this arrangement it was possible to advertise for the purchase of the lumber concurrently with the advertising of the project, thereby expediting delivery.

The untreated-timber trusses were fabricated, including the grooving for the ring connectors and boring of bolt holes, and completely assembled at the Longview, Wash., mill of the Weyerhaeuser Sales Co., then match-marked, disassembled, and shipped in box cars to the Montana Highway Commission at Columbus, Mont. The trusses were erected in their final positions on the same falsework used for pile-driving operations and the prefabrication was so well done that a crew of eight to twelve men erected a self-supporting truss in three to four days with a record of two days made on one of the spans.

Random riprap, from 1 cubic foot to 1 cubic yard in size, was placed around all piers. Material for the riprap was secured without blasting from a disintegrating cliff slope about 4 miles away, hauled in dump trucks, and placed by the trucks dumping from the falsework. The dumping around the piers resulted in a natural slope of about 1 1/4 to 1 for the riprap. Some hand-placed riprap was used to protect the shore end at the widening of the old fill.

## Surfacing the Deck

After the laminated deck was completed, with curb and drains in place, the entire top surface of the deck and the inside of the 6 x 12-inch curb were treated with three coats of tar, heated to 200 degrees and evenly brushed on at a rate of 1/4 gallon per square yard. After the application of tar, 1 1/2 inches of gravel surfacing, meeting the following specifications for grading, was placed:

Passing 1-inch sieve	100 per cent
Passing 3/4-inch sieve	85 to 100 per cent
Passing No. 4 sieve	45 to 65 per cent
Passing No. 10 sieve	30 to 50 per cent
Passing No. 200 sieve	5 to 10 per cent

It is contemplated that the oil-mat surfacing on the approach road will be carried across the bridge floor later.

## Major Quantities

Major quantities involved in this contract included the following:

Untreated lumber, furnished by State and erected by contractor	190.12 MFBM
Untreated lumber, furnished by contractor	15.53 MFBM
Timber piling	2,936 lin. ft.
Gravel ballast	41 cu. yds.
Random riprap	1,200 cu. yds.
Hand-laid riprap	60 cu. yds.

## Personnel

The contract for this work was awarded

to Walter Mackin, Billings, Mont., on his bid of \$38,316.46. This price included the cost of the material furnished by the State. Seventy-five working days were allowed for the completion of the project which was actually completed in 72 days over an elapsed time of about 5 1/2 months. F. P. Robbins was Project Engineer for the Montana Highway Commission, of which Howard Holmes is Chief Engineer and R. A. Stephenson is Bridge Construction Engineer.

## Chicago Office Opened By Brooks Equip. Corp.

The Brooks Equipment Corp., 90 West St., New York 6, N. Y., manufacturer and designer of shaft joints, accessories and complete assemblies for hand-operated remote controls, has opened a branch office at 1 No. LaSalle St., Chicago, Ill., to serve the Great Lakes and mid-west area. The new office will be under the direction of James K. Grindle, formerly Sales Engineer with the General Electric Co. of Chicago.

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**WITH THE AMAZING**  
**SERVICE RECORD**

Reduces mop cost 25 to 50%!  
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Now with still further improved construction for even longer life. Two popular sizes: #1624 for 14 to 24 oz. mops; #2436 for 20 to 36 oz. mops.

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**TAKE WIDER BITES**

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**PETTIBONE MULLIKEN CORPORATION**

Established 1880

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Teeth set wide out at the corners of the lip enable PMCO Welded Dippers to take a wider bite that assures a fully loaded dipper.

This efficient wide set corner tooth location is possible only with a solid manganese steel front. The strain imposed by wide set corner teeth would break up a front of rolled sections or plain carbon steel.

Pettibone Mulliken engineers believe that efficiency in operation and strength in power shovel dippers should not be sacrificed by using cheaper materials to meet a price.



# South Texas County Meets Unusual Tasks

## Mileage of Concrete Roads Built Without Joints and Many Irrigation Districts Create Numerous Problems

• CAMERON County in the southern-most tip of Texas faces problems in the maintenance of roads and bridges far different from those of most counties of the state. Situated in the rich agricultural district of the Rio Grande valley, this county built concrete roads in the 1920's without providing expansion joints on the major portion of the projects, and resulting blowouts account for much of the maintenance expenditure. Another problem complicating the work of the County Engineer is the existence of fifteen active irrigation districts in the county as well as two navigation districts. Each of these is a separate entity, with its own consulting engineer whose ideas regarding distribution of irrigation water and discharge of excess rainfall, being dictated by the needs of the district he represents, do not always fit into the needs and plans of the county as a whole. Since the County Engineer has no regulatory authority and can only advise and request, the activities of these districts often necessitate unforeseen county expenditures for enlargement of drainage structures, outlets, etc., because 50 per cent of the cost of the necessary work comes from the county road fund. The Rio Grande valley irrigates, not because annual rainfall is deficient but

because its distribution is poor, and at certain times excess water becomes a serious problem, necessitating expenditures by the county for levees and additional drainage structures.

### Timber Bridges

Although the county has four bridges with 16-foot roadways of wood stringers and decks carried on 50-foot steel trusses, the present policy favors creosoted-timber pile trestles with a 20-foot roadway for major drainage structures. Cameron County builds them with county forces, after the creosoted timber, if the amount involved is in excess of \$2,000, has been purchased on competitive bids. The treatment specified is 16 pounds per cubic foot for piling, 12 pounds for stringers, caps and bracing, and 8 pounds for laminated decks.

Piles with 8-inch tips and 12-inch butts in lengths of 20 to 30 feet are driven by county forces, using swinging leads handled by rented cranes, to a bearing of 20 to 30 tons per pile. Stringers of 4 x 14-inch timber span the 16 feet between 12 x 12-inch caps and are covered by 2 x 4's laid on edge to form the laminated decks.

Hand-rails are built of 6 x 6-inch posts with 6 x 10's at the ends, and have a single 3 x 8-inch rail. No hand-rails are more than 30 inches high because of the large number of wide loads moved over the county road system for which the 20-foot roadway bridges are too narrow unless provision is made for possi-

ble overhang.

On the laminated floor a tack coat of 0.35 gallon of asphalt emulsion per square yard is applied by a 55-gallon Tarrant sprayer. For bridge-floor surfacing, pre-mixed asphaltic material is shipped from the Servtex Materials Co., at New Braunfels, unloaded by hand to flat trucks, and delivered to the bridge sites, with any excess going to county storage. Spread by hand to a loose thickness of 2 inches, the pre-mixed material is rolled by a Littleford Trail-O-Roller loaded to give a compaction of 152 pounds per square inch, resulting in a 1½-inch compacted thickness.

For dewatering excavations or the temporary handling of irrigation or drainage flow during the construction of minor drainage structures by the county forces, a 3-inch direct-connected CMC centrifugal pump and a shop-mounted 8-inch centrifugal pump on an old automobile frame, driven through a 2 to 1 reduction by V-belts from a Chevrolet engine, are used. County Engineer A. G. Ruff reports that the shop-built unit can

handle 2,000 gallons per minute on a 20-foot lift.

Concrete for head walls is mixed in the county's Smith 4-S tilting-drum mixer. Six Ford and Chevrolet trucks which the county has acquired and equipped with 7-inch-cylinder Anthony hoists are used for hauling.

### General Maintenance

For general ditch and shoulder maintenance, Cameron County uses six Caterpillar and one Adams motor graders and four RD7 tractors with 12-foot Caterpillar blade graders. In some cases this equipment is used to build farm roads with 9 to 16-foot tops. When this is done, the fills are compacted by the county's 6,500-pound (empty weight) Buckner sheepsfoot roller. If the interested property owners purchase the surfacing material, the county places and compacts it with its own forces.

Considerable maintenance expense has resulted from blowouts on the concrete roads constructed with no provi-

(Concluded on page 83)

When You're Pouring Concrete, Use . . .

# SISALKRAFT

OVER THE SLAB  
... TO CURE AND  
PROTECT FROM  
DRIP AND DEBRIS

Waterproof, tear-resistant, scuff-proof SISALKRAFT retards evaporation and protects the concrete from dirt, dripping grout and debris.



ALL AROUND  
THE JOB FOR  
PROTECTION  
FROM FROST

Used all around the building, SISALKRAFT holds in the heat from salamanders or other heating units. On the large building job illustrated, the SISALKRAFT blankets are all in place, despite a gale that lasted 24 hrs.

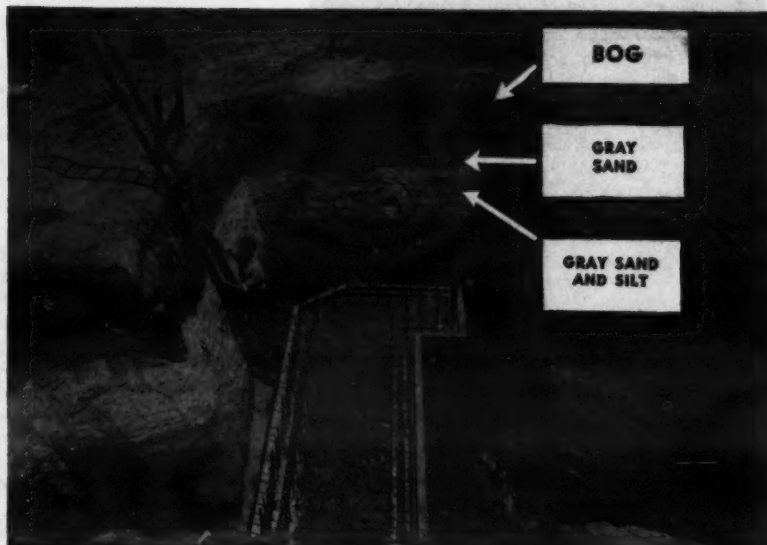


For nearly 25 years the unmatched performance of SISALKRAFT has made it the Number One concrete curing and protecting agent. Use it when you're pouring concrete — for buildings, runways and roads.



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## AND GRIFFIN WELLPOINTS 75 FEET DISTANT!

Yes—the Griffin Wellpoints installed around an area 75 feet away so thoroughly predrained the ground that no additional wellpoints were needed—and no shoring or sheeting either! Dense stuff, hard to pre-drain—yet Griffin Equipment DRIED IT! Results count—why say more?

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**GRIFFIN WELLPOINT CORPORATION**



### LaPlant-Choate Directors Named at Recent Meeting

Among the directors chosen at the annual stockholders' meeting of the LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa, were the following men prominent in the heavy-equipment field: Alfred Kauffmann, former President and current Director of the Link-Belt Co., Chicago, who will serve as Chairman of the Executive Committee; Roy Fruehauf, Executive Vice President, Fruehauf Trailer Co., Detroit; and Howard Hall, President, Iowa Mfg. Co., and Iowa Steel & Iron Works, Cedar Rapids, Iowa. Roy

E. Choate, President of the company since its incorporation in 1927, and S. E. Coquillette, President of the Merchants National Bank of Cedar Rapids, were reelected Directors, and Archie D. Dennis, Secretary-Treasurer, was also chosen to serve in that capacity.

It has also been announced that the company's policy of selling its tractor equipment, built exclusively for use with Caterpillar tractors, through Caterpillar distributors and export dealers only will be continued temporarily. However, the complete LaPlant-Choate line of earth-moving and land-clearing equipment, including important wartime develop-

ments, will eventually be designed, built and made available for use with other makes of track-type and high-speed rubber-tired tractors.

### Worker's One-Piece Goggle

A new safety goggle made of one piece of clear Plexiglas giving undistorted and unrestricted vision with maximum protection against impact hazards has been announced by Eastern Equipment Co., Inc., Willow Grove, Pa. Since Plexiglas has the same qualities as the finest optical glass, the Amcowedl Plasti-Goggle can be worn all day without eye

strain or fatigue.

The goggles are spatter-resistant, light in weight and, due to the smoothly rolled edges and  $\frac{3}{4}$ -inch-wide full elastic headbands, are comfortable to wear.

Complete information, pictures and prices, may be secured direct from the manufacturer by mentioning this news item.

The total highway mileage in the United States on January 1, 1944, was 2,980,823, according to the AASHO. Of this total, 442,543 miles are classed as improved roads and 480,352 miles are on the state highway systems.

## EQUIP YOUR PRESENT TRACTORS WITH USEFUL ATHEY MOBILoadERS!



### You Can Increase Your Tractor's Range of Uses . . . Give It Extra Work To Do

WHY NOT step up the usefulness of your present "Caterpillar" Diesel Tractor by equipping it with an Athey Mobiloader?

One or more of your present machines possibly has just completed a construction job—operating a bulldozer, or pulling a wagon or scraper and now stands idle. Is there some maintenance work, rebuilding or improving it could be doing?

You can keep your machines busy with the fast-working, cost-cutting Athey Mobiloader—the machine that has countless uses.

Athey Mobiloaders are backed by 4 years of performance in the field. They've piled up records of big production on loading operations of all kinds.

They're loading stock piled gravel, stone, rock, coal, ore, earth, snow and other materials quickly and economically. They're working in gravel pits—on coal stripping operations—in ore mines—loading many materials in less time, at less cost.

Bucket capacities for the Model W4-1 Mobiloader range from  $\frac{3}{4}$  to  $1\frac{1}{8}$  cubic yards; Model 8 Mobiloader has bucket sizes from  $2\frac{3}{4}$  to  $4\frac{1}{2}$  cu. yds., depending upon the type of material.

Used by the Armed Forces on battle fronts in every theatre of war, they're sold and serviced by the world-wide "Caterpillar" dealer organization which has no equal.

Ask your ATHEY-"Caterpillar" Dealer, or write direct to Athey Truss Wheel Co., 5631 W. 65th St., Chicago 38, Illinois, for further information.

### MOBILoadERS

ARE AVAILABLE FOR

"CATERPILLAR"

D4 & D8

TRACTORS

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SEE YOUR DEALER

You get big-capacity, high-speed loading with the proved overhead Athey Mobiloader, plus ample crowding action for digging.

# ATHEY

FAST, DEPENDABLE  
LOADING EQUIPMENT





# Roller Production On Compaction Tests

(Continued from page 65)

sity was obtained with eight or less trips on 77 per cent of the lifts compacted by the sheepsfoot roller, four or less trips on 74 per cent of the lifts compacted by the three-wheel roller, and six or less trips on 93 per cent of the lifts compacted by the pneumatic-tire roller.

The average densities of the compacted fills in Ohio were very satisfactory. Although the minimum densities in some cases were considerably below the percentage specified, all lifts, with the exception of those in section 8, were compacted to a density of more than 90 per cent of the maximum as indicated by the compaction test. Only three lifts in section 8 fell below this mark. These three lifts had densities equal to 83, 83.8, and 89.5 per cent of the maximum.

## Roller Production

Despite the fact that the required compaction was obtained by fewer trips of the three-wheel roller than by other types of rollers, higher production in cubic yards compacted per hour was obtained with the pneumatic-tire and sheepsfoot rollers on the Indiana project where the fill material was placed in 6-inch lifts and on the Ohio project for both 6 and 9-inch lifts. Differences in width and speed of roller account for this.

For example, the Type A sheepsfoot roller covered a strip 106 inches wide as compared with 60 inches for the pneumatic-tire roller, while for the three-wheel roller the total width of the rear rolls was 46 inches on the Indiana project and 40 inches on the Ohio project. At equal speeds the sheepsfoot roller could roll a given area once in 57 per cent of the time required by the pneumatic-tire roller, in 43 per cent of the time required by the three-wheel roller in Indiana, and in 38 per cent of the time required by the three-wheel roller in Ohio. Stated in another manner, at equal operating speeds the sheepsfoot roller could roll an area approximately 1.8 times as fast as the pneumatic-tire roller, 2.3 times as fast as the three-wheel roller in Indiana, and 2.6 times as fast as the three-wheel roller in Ohio.

The average speed of the sheepsfoot roller of 256 feet per minute on section

1 in Indiana was the maximum obtainable with the 40-hp tractor used to pull the roller. The speed of the pneumatic-tire roller was influenced by safety considerations. The roller had a tendency to tip over, so it was necessary to operate at slow speed along the edges and sides of the fill. Speed was increased on the central portion of the fill. This difficulty was not encountered with the sheepsfoot roller which could readily adapt itself to uneven and irregular surfaces.

In accordance with the specification requirements, the three-wheel roller in Indiana was operated in extreme low gear at approximately 3 feet per second. On one lift of section 2 the speed was increased to about 6 feet per second. The density determination showed that the compaction was undiminished at the higher speed and that an increase in roller capacity corresponding to the increase in speed could be obtained.

On the Indiana project the pneumatic-tire roller compacted a cubic yard of soil in 6-inch lifts in less time than the other rollers. The greatest number of trips of actual rolling was recorded for the three-wheel roller on section 2. The maximum production of 361 cubic yards per hour was obtained with the pneumatic-tire roller on section 8 as compared with 244 for the three-wheel roller on section 2, and 341 and 255 for the sheepsfoot roller on sections 1 and 3, respectively.

With respect to the production of the sheepsfoot roller on sections 1 and 3 in Indiana, the greater production was obtained on section 1 even though the average number of trips required to obtain the specified density was 5 per cent higher. The increase in production of 33 per cent is attributed entirely to the increase of 38 per cent in the roller speed. On the Indiana sections where the material was placed in lifts having loose thicknesses of 9 and 12 inches, greater production was obtained with the three-wheel roller than with the pneumatic-tire roller. The sheepsfoot roller was used only on the 6-inch lifts. A very definite increase in production was accomplished by increasing the lift thickness.

On the Ohio sections where the soil was placed in 6-inch lifts, 12.9 seconds were required to compact a cubic yard of soil with the sheepsfoot roller on section 4 and 19.9 seconds on section 1. These figures compare with 16.4 seconds for the pneumatic-tire roller on section 3 and 19.9 seconds for the three-wheel

roller on section 2. The least amount of time necessary to compact 1 cubic yard on the sections constructed in 9-inch lifts was 13 seconds with the pneumatic-tire roller.

The maximum production of 279 cubic yards compacted per hour in Ohio, was obtained with the sheepsfoot roller

on section 4. On section 1, however, the sheepsfoot roller was able to compact only 181 cubic yards per hour. The greater production on section 4 indicates that the higher moisture content of the soil was significant in facilitating compaction. The average variation from

(Continued on next page)

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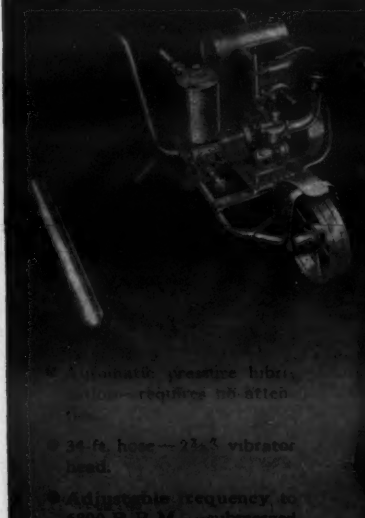
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# Sheepsfoot Results On Test Embankments

(Continued from preceding page)

the optimum moisture content on section 4 was minus 1 as compared with minus 2 on section 1. The percentages of the total number of lifts compacted at moisture contents below the optimum on sections 1 and 4 were, respectively, 94 and 74 per cent.

The average number of cubic yards compacted per hour in Ohio by the different rollers is summarized in the following table:

Sheepsfoot roller:	
6-inch lift	245 cu. yd.
9-inch lift	255 cu. yd.
All sections	247 cu. yd.
Pneumatic-tire roller:	
6-inch lift	220 cu. yd.
9-inch lift	277 cu. yd.
All sections	227 cu. yd.
Three-wheel roller:	
6-inch lift	181 cu. yd.
9-inch lift	247 cu. yd.
All sections	216 cu. yd.

These Ohio data disclose maximum production with the sheepsfoot roller on the 6-inch lifts and with the pneumatic-tire roller on the 9-inch lifts. Although the increase in production obtained with the sheepsfoot roller as a result of increasing the lift thickness is very small, the production of the pneumatic-tire and three-wheel rollers was increased materially. The production and compaction rates varied according to different operating speeds of the roller. The data show a wide variation in volume of fill compacted per hour for the different roller speeds. There is, however, a definite indication that greater fill production was obtained at the higher speeds without any sacrifice in the quality of the compaction.

## Sheepsfoot vs Other Rollers

Of the one hundred lifts on which the sheepsfoot rollers were used in Ohio, eighty-seven were compacted by the Type A roller and thirteen by the Type B roller. The average densities obtained with each roller and the average number of trips required to obtain this density were as follows: Type A roller with 7.8 trips produced 98.7 per cent of maximum dry density and Type B roller with 6.8 trips produced 97.7 per cent.

The Type B roller was used only on eight lifts of section 4, and five lifts of section 6. The remaining lifts on these sections were compacted by the Type A roller. On section 4 both rollers were loaded to capacity and an attempt was made to obtain the specified 100 per cent compaction.

On section 6 in Ohio, in addition to using both rollers with the drums full of water, Type B roller was also used with the drums about half full of water. All lifts were compacted by six trips and the soil densities were found to be satisfactory. Data on sections 4 and 6 indicate that slightly better results were obtained with the Type A roller than with Type B, and that the Type B roller was more effective with the heavier load. Since there were variations in soil and moisture content at the time of compaction and the data are limited, it seems that the differences in compaction are not great enough to be significant.

## Sheepsfoot Loading in Indiana

To meet the requirements of the specifications relating to the ground pressure under each tamping foot of sheepsfoot roller Type A in Indiana, it was necessary to fill the drums with water. There was a tendency at times for the tamping feet to pick up the soil and tear material loose rather than compact it. This was overcome by drawing out part of the water and reducing the ground pressure under each foot from 209 to 164 pounds per square inch. The required compaction was readily obtained in this manner.

Sheepsfoot roller Type B was used only on six of the twenty lifts in Indiana section 1. It was first tried with the drums full of water. Under this load the feet dug up the soil, and satisfactory compaction could not be obtained. It was then used with the drums half filled with water and gave good results. The most efficient operation was obtained when the drums were empty. In this condition the ground pressure under each tamping foot was approximately equal to that of sheepsfoot roller Type A partially filled with water.

## Compaction by Other Equipment

The compaction produced by construction equipment other than rollers was investigated on lifts 5 and 6 of Indiana section 7. Density tests were made in the path of the bulldozers and tractors spreading the material deposited by trucks. These tests were in addition to those performed after compaction by the pneumatic-tire roller, which was used on portions of lifts 5 and 6, as well as on the other lifts comprising the fill section.

The normal movements of the 17-ton tractor-bulldozer used in spreading the soil on lift 5 produced a density of 94.4 per cent of the maximum wet density. Two passages of an 11-ton tractor increased the density to 97.5 per cent. This compares with 101.1 per cent obtained with three trips of the pneumatic-tire roller.

On lift 6 the density obtained with the 17-ton tractor-bulldozer was 93.3 per cent of the maximum wet density. In one location, two passages of the 11-ton tractor did not increase the density, while in another instance the density was increased to 96.2 per cent. This difference may be accounted for by the fact that in the former case the lower 2 inches of the lift was uncompacted.

(Continued on page 86)

## Light and Power for the Contractor

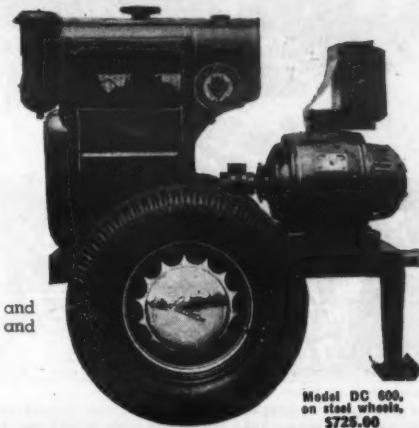
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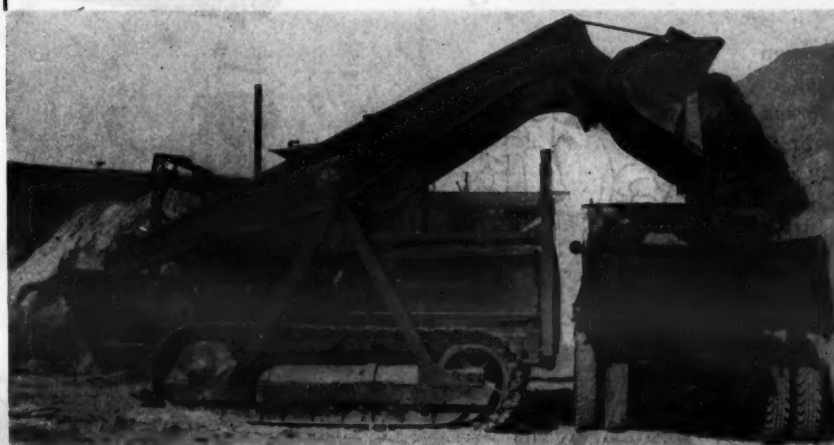


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British Combine Photo  
Rubble from a damaged factory on the outskirts of Caen in France, long used by the Germans, is going into vital military roads for the Allies. Here Royal Engineers and Pioneers are at work near the River Orne.

## Glynn County Report Shows Much Progress

The Commissioners of Roads and Revenue of Glynn County, Ga., with H. J. Friedman, Engineer-Director, have, over a period of years, been most active in the development of state and county highway and bridge projects, as well as other public works, to improve traffic and living conditions in this coastal county. The Fifth Annual Report for the fiscal year ending June 30, published October 1, 1944, shows unusual progress during the past year in plans for and the construction of state highways within the county and other work by the county itself.

The State Highway Board of Georgia, with the aid of Glynn County, has sponsored the designation of the Coastal Highway, U. S. 17, from Savannah, Ga., to the Florida line, as a part of the national system of interregional highways and the state's plans for its post-war improvement as a four-lane highway are well under way. The state has authorized automatic signal protection for a dangerous road grade crossing near Arco to eliminate a hazard that has resulted in many serious accidents in the past.

Advertising for bids for paving from Sterling to Everett City has been authorized by Ryburn G. Clay, Director, State Highway Board of Georgia, which will place in service a 10-mile section of road that will eliminate three main-line railroad grade crossings as well as low sec-

tions on the present road subject to overflow from the Altamaha River. A contract was let also by the state for resurfacing the road from Sterling through Thalmann to the Brantley County line, and on the Waycross Highway a contract has been completed for raising and resurfacing approximately 2 miles of road near the Seaboard Air Line crossing, at a cost of \$55,000.

On the Coastal Highway the South Altamaha River Bridge, a concrete-steel four-lane structure 2,382 feet long and constructed at a cost of \$804,144, was opened to traffic in October, 1943. The Darien River Bridge of similar design and 1,453 feet long has been completed at a total cost of \$1,098,163. (See C. & E.M., June, 1944, pg. 1). Both of these bridges are of high-level fixed-span design which eliminates the heavy expense and delays to traffic where movable spans for navigation are employed.

During the past year Glynn County has completed substantial permanent improvements, including an FWA contract for a sewage-treatment system on St. Simons and Sea Island, at a cost of \$432,000, covering 14 miles of mains, four pumping stations, and a treatment plant. This system, which will be placed in operation early in 1945, will permit eliminating septic tanks which in recent years, under congested war-emergency living conditions, have endangered health and caused pollution in the adjacent waters.

Several playgrounds have been estab-

lished in cooperation with the cities to serve war industries, and plans for the Frederica National Monument are proceeding, with land acquisition completed. A post-war program covering prompt and substantial road and general-site improvement has been scheduled by the National Park Service.

The policy of deferring capital improvement until the post-war period, when labor and critical material will again be readily available, is being continued. The reserve for these improvements is being accumulated and invested in U. S. Savings Bonds. For the past five years, the county has lived within its income and has had available for reserve for post-war improvements the annual sums of \$22,316, \$34,958, \$76,293, \$78,545 and \$68,400 respectively. The county reserve for post-war improvements now totals \$270,965 purchase value of U. S. Savings Bonds. In this same period, from 1940 through 1944, the county has reduced its outstanding bonded indebtedness from \$524,000 to \$346,000.

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IS ON THE WAY

When construction actually begins on the postwar plans that are on today's drawing boards, Insley Excavators will do their full share to help make these plans a reality.

No one can predict when this day will be but when the time comes, Insley Excavators will be ready to do your difficult dirt moving and material handling jobs . . . do them faster and cheaper than you've ever seen them done before.

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U. S. Engineers Photo  
The hot-mix strengthening course for runways was laid in 10-foot lanes by a Jaeger bituminous paver. In the dry climate of Arizona "a man can raise a thirst"; hence the operator's Eagle Brand water bag hung on the paver at the right.

## Yucca Airfield

(Continued from page 23)

chassis and powered by the Ford engine, the asphalt was heated by a 40-hp horizontal boiler which also provided steam for the drier engine and for the circulating pumps. A Caterpillar D17000 engine furnished power to drive the asphalt plant.

Because there was no convenient source of water supply, a 500-gallon tank truck hauled water for use in the boiler from the airfield water system. A 2-inch Jaeger pump transferred this water to a 1,500-gallon steel storage tank at the plant site.

A 2,500-pound batch was mixed for 45 seconds in the pugmill of the asphalt plant, which had a nominal capacity of 1,000 pounds. The asphalt content of the batch varied from 4.8 to 5.25 per cent and the aggregates met the following specified gradation:

Passing	Per Cent
1-inch screen	100
3/4-inch screen	85-100
1/2-inch screen	73-88
No. 4 sieve	46-60
No. 10 sieve	32-47
No. 40 sieve	16-26
No. 80 sieve	10-18
No. 200 sieve	4-8

The average gradation of the batches was as follows:

Passing	Per Cent
1-inch screen	100
3/4-inch screen	90
1/2-inch screen	78
3/8-inch screen	66
No. 4 sieve	55
No. 10 sieve	42
No. 40 sieve	22
No. 80 sieve	12
No. 200 sieve	5
Asphalt	6

Five batches constituted a load for the fifteen Ford and Chevrolet trucks which were weighed on a 30,000-pound-capacity Howe platform scale set up near the asphalt plant.

### Laying the Pavement

A 2-inch hot-mix leveling course was laid on the base course of the widened portions of the taxiways, after applying a tack coat of MC-1, prior to strengthening the 75-foot width with the top course. Prior to placing the hot-mix top course,



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INDIANA

the original surface of the existing runways and taxiways received a tack coat

of 0.1 gallon of RC-3 per square yard applied by a 1,200-gallon distributor mounted on a Mack truck.

The trucks delivered the hot-mix to a Jaeger bituminous paver which spread the 2-inch surface in 10-foot lanes. Starting at the center of one end of a runway, the lane was continued for the full 6,000 feet of its length. Its direction reversed, the paver then placed the second lane against the first continuously to the other end of the runway, then started back again on the opposite side of the lane first placed. At each end thereafter, the mixer was moved across the surfacing already placed and worked back in a reverse direction on the opposite side until the entire 150-foot width had been covered. Two men with the operator dumped the trucks and did the necessary hand raking.

The asphaltic mixture, which had been heated to 275 degrees at the plant, was placed at an average temperature of 250 degrees and rolled, 4 or 5 hours later, when its temperature was approximately 180 degrees. The average daily produc-

tion was 600 tons.

### Major Quantities

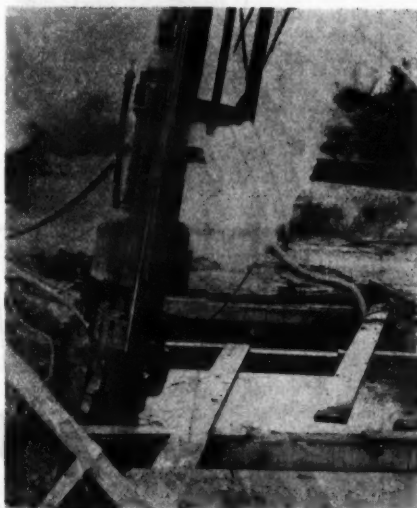
The major quantities of this contract included the following:

Load testing earth subgrade and gravel base (A square equals 100 square feet)	28,000 squares
P.C. concrete pavement 13:11:13	50,000 sq. yds.
Hot plant-mix	33,000 tons
Excavation	25,000 cu. yds.
Gravel base	7,000 cu. yds.
Gravel shoulder	7,500 cu. yds.
Removal of existing bituminous surface	12,500 sq. yds.

### Personnel

The contract for improvements to the Yucca, Ariz., Army Airfield was awarded to the Tiffany Construction Co., Phoenix, Ariz., on its low bid of \$360,000, by the Los Angeles District, U. S. Engineers, on March 21, 1944, and the hot-mix surfacing was completed on September 15, 1944. N. W. Axline was Superintendent for the contractor. For the U. S. Engineers, the work was under the direction of Col. Rufus W. Putnam, District Engineer, with Alvin L. Saunders, Resident Engineer, and John W. Joyce, Assistant Resident Engineer, in direct charge of operations at Yucca.

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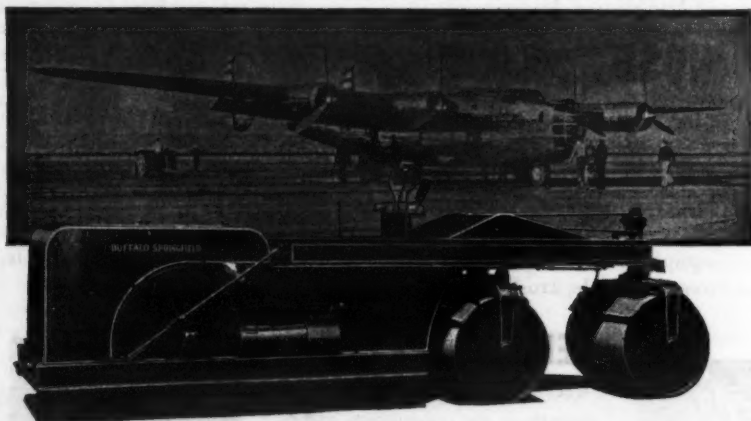
The new Hyster power-control unit for mounting on a Caterpillar D4 tractor.

### Power-Control Units Also Towing Winches

A new power-control-unit auxiliary drum for use with the D4 towing winch made exclusively for the Caterpillar D4 tractor has been announced by the Hyster Co., 2952 N.E. Clackamas St., Portland 8, Ore., and 1852 No. Adams St., Peoria 1, Ill. The new unit, while designed as a bulldozer power-control unit, provides many additional hoisting and towing services with either the Caterpillar D4 or R4 tractor. The manufacturer states that it is simple, quick acting, and has only one lubricating fitting which presents no service problems.

Form 690 describing this power-control unit in detail and showing its many applications in the construction field will be sent promptly on request by the manufacturer to those mentioning CONTRACTORS AND ENGINEERS MONTHLY.

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### States Use Own Cash To Plan State Roads

The funds which have been made available by Congress to aid state highway departments in post-war planning are still "largely available", but this does not mean that the highway departments are not doing anything about their planning. Of the \$60,000,000 of Federal funds set up for planning, two-thirds remained idle as of June 30, 1944, according to the most recent statement issued by the Public Roads Administration. Nevertheless, it is known that most of the states which have applied for little or no Federal planning funds are making good progress.

The answer to this is that many states, for one reason or another, prefer to handle their planning with their own funds, conserving Federal-Aid funds for post-war construction. For a year after the emergency, the states may obligate their share of the \$50,000,000 funds for either planning or construction. The \$10,000,000 fund is for planning only and its use expires with the termination of the war emergency.

Of the \$50,000,000 earmarked for highway planning by Congress on June 13, 1943, only \$11,874,199, or 24 per cent, had been allotted to specific projects by June 30, 1944. Of the \$10,000,000 authorized in the Defense Highway Act of 1941, \$6,357,909, or 63.5 per cent, had been allotted. The total from both funds awaiting allotment was \$39,747,883.

### New Florida Representative

The Buffalo Tank Corp. with plants in Buffalo, N. Y., and Dunellen, N. J., manufacturer of steel storage tanks, pressure vessels, bins, steel stacks, breech-

ings, steel pipe and other equipment of welded steel-plate construction, has appointed H. J. Hechler as District Manager in charge of sales and service in

the state of Florida. The new Buffalo Calculator on ASME Code pressure vessels may be obtained from Mr. Hechler at 125 N. E. 6th St., Miami 11, Fla.

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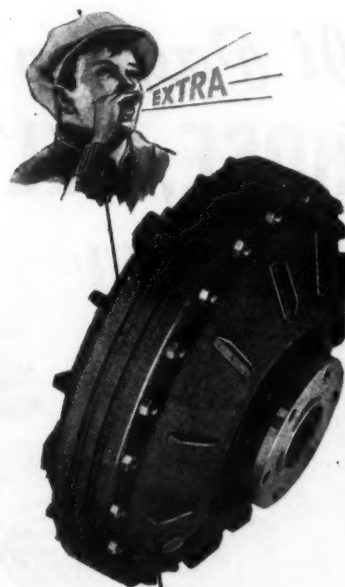
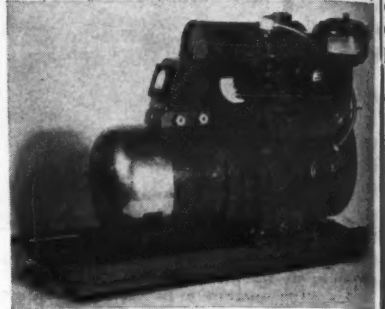
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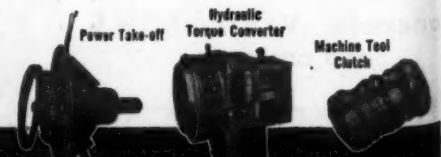
**NEWTON, IOWA**



## LATEST NEWS ON HYDRAULIC COUPLINGS

In all types of equipment driven by internal combustion engines, there is a definite trend toward hydraulic couplings as the connecting link to assure increased wear-life and better performance. Owners, operators, and engineers agree that shock loads are often responsible for a large part of the maintenance cost of a driven unit, and that this cost can be sharply reduced through the use of hydraulic couplings. In addition, an hydraulic coupling will give the machine added flexibility . . . a smoother work cycle.

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SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918



# Care of Roadsides Cut During Wartime

(Continued from page 49)

In open and cultivated areas, a right-of-way clean-up once a year is usually necessary for the same reasons as previously mentioned for mowing, namely, control of noxious weeds or snowdrift prevention.

In wooded areas, however, this right-of-way clean-up can be dispensed with, (or at least done only once every two years instead of every year), except perhaps in some very high-fire-risk areas, or in some swampy areas where growth is so dense and rapid that it would be more costly to cut after two or more years than it would be to cut each year while the growth is young and small.

It is in wooded areas where elimination of clean-up can save much labor, at the least sacrifice to appearance. Since the wooded land adjacent to the right-of-way is rough in appearance, a rough-looking right-of-way, back of the gutter lines, is not out of place. In fact, it blends well with the surrounding woodland.

There is one other distinct advantage to the elimination of right-of-way cutting, particularly on high steep slopes. To cut these steep slopes, laborers must walk around over them and every scuffing footprint is a potential source of new erosion, the very thing that vegetation on the slope is intended to prevent. What many steep slopes, on which some light vegetative cover has been established, need most is a lot of "letting alone" so that a volunteer native grass, vines, and woody tree and shrub growth can become established, with deeper roots, to hold the soil more firmly.

Of course, in all curtailment or elimination of mowing and right-of-way clean-up, it must always be remembered that sufficient labor, equipment and funds must be reserved first of all to: (1) keep sight distance open on the inside of curves and at intersections; (2) keep directional and warning signs clearly visible at all times; (3) keep all guard rails and guard posts exposed; and (4) keep pipe lines, culverts, and bridges free from any growth that might obstruct drainage or cause the collection of debris that would tend to obstruct drainage.

## Weed Control

In some states the highway organizations are required by law to eradicate noxious weeds within highway rights-of-way. Even where there is not a legal requirement, it is in the public interest to keep noxious weeds from spreading to farms, particularly in this wartime period of farm-labor shortage and need for increased crop production.

Therefore, this phase of roadside maintenance must be continued without curtailment, but some states have been successfully making a substitution of materials: California has found borax successful for the control of Klamath weed, and Missouri is using an "agricultural mesh" borax instead of sodium chlorate for the eradication of bindweed.

Missouri finds this borax cheaper than sodium chlorate, safe to handle, and non-poisonous to animals. It can be stored indefinitely, needs no special equipment or operators to apply, and grass will come back after one year's time. It is applied by hand or lime spreader at the rate of 15 pounds per square rod (5 pounds per 10 square yards) in early spring or late autumn.

## Roadside Parks

One of the first roadside-maintenance economy moves contemplated in many states was the closing of roadside park areas and smaller picnic-table sites. The closing was generally postponed for a period of observation and it was soon found that the amount of use of these areas remained practically the same as in pre-war years. The type of use made of these sites changed considerably, switching principally from tourist traffic to use as rest stops by interstate truckers and to use as recreational areas by residents of nearby crowded war production centers, since they could be reached without driving great distances.

The maintenance of roadside-park areas is one case where there is little chance for a middle ground between elimination and full maintenance. If use warrants the continuation of the area, it should continue to receive a high standard of maintenance. If, on the other hand, an area is to be closed, any movable equipment should be removed and stored, directional signs removed, and entrance roads closed if possible so that use of the area will be discouraged.

## Tree and Shrub Care

The general attitude toward the care of trees and shrubs that have been pre-

served or planted for landscape effect seems to be one of doing only enough maintenance to protect the plant investment rather than to keep them up to the optimum appearance.

Pruning, sufficient clean-up to eliminate the fire hazard, and a minimum of cultivation to prevent weakening of the plantings are needed, but fertilizing, extensive cultivation, and minor practices such as careful outlining of plant beds can be generally curtailed.

The pruning and spraying of large shade trees can usually be reduced except in areas of serious disease or insect infestation, or where trimming is essential for the safety of traffic. Some states have reduced trimming to a very minimum but continue a full program of spraying in order to keep the trees healthy and avoid a still greater amount of trimming a year or two later.

Since trimming, other than for safety, is an operation that can be carried on in a slack winter season with either small or large crews, it is one phase of roadside maintenance that can be easily and

rapidly adjusted to sudden changes in conditions.

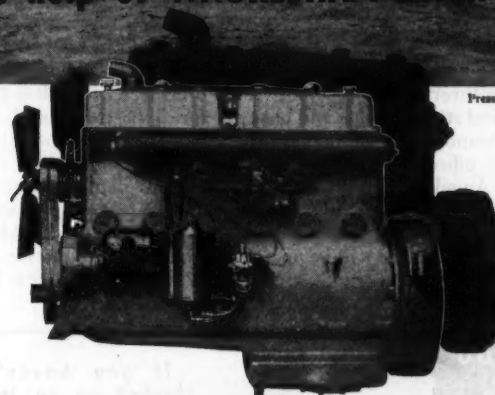
An interesting point brought out in connection with roadside plant maintenance is that where native species of plants were selected and planted with thought being given to plant ecology, such plantings are requiring little or no attention and therefore will not be affected by the wartime reduction in maintenance.

## Highways in Britain

England's system of highways, which has been in the process of construction and improvement for 2,000 years, now totals approximately 180,000 miles, according to a recent issue of *Highway Highlights*. Trunk highways and Class I roads amount to about 15 per cent of the total; Class II roads to 10 per cent, and the remaining unclassified 75 per cent is comprised of residential streets and country lanes. Most of England's highways and streets have all-weather surfaces, it is reported.



Press Association, Inc.



● Powered by Waukesha Engines, two of a battery of big Ingersoll-Rand K-500 portable air compressors ... mounted on the barge at the right ... are shown helping to raise the U.S.S. Oklahoma after the Japanese raid on Pearl Harbor.

A battleship of some 29,000 tons, the Oklahoma had completely capsize before sinking. Lying in shallow water—bottom up—she had to be righted as well as floated.

To raise her, compressed air in large volumes was used—to force water in flooded compartments down and out through valves fitted to bottom plating—or, to lower water by expelling it through holes in the hull, closing holes with emergency patches and then unwatering the compart-

ments. Here was another place where Waukesha wartime engines could and did help the Navy to speed up its tremendous task of salvaging.

Seventeen months after Pearl Harbor 16 of the 19 ships that had been sunk and damaged were salvaged and back in active service with our Navy.

When time counts ... and it did here more than it ever had before ... you can push Waukesha-powered equipment far, fast and furious—all around the clock again and again until the job is done. That's dependability! Waukesha wartime engines have it. The new Waukesha peacetime engines will have it, too. Consult Waukesha about your future engine needs.

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# WAUKESHA ENGINES

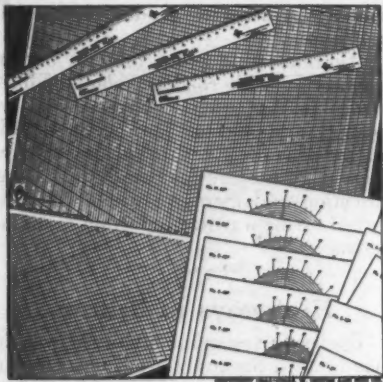
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Included in the Truper line of Charles W. Downs & Sons Co., 2280-2300 14th St., Detroit 16, Mich., is a wide variety of perspective graphs which permit the draftsman to show his subject at any chosen angle. There is also a set of true perspective circles, not ellipses, which avoid the distortion usually found where ellipses or free-hand circles are used. Perspective scales, showing diminishing units of measurement as they recede toward the vanishing point at the designated angles, are another item.

Complete information regarding these aids will be found in a bulletin "Precision Perspectives" which may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

## H. K. Porter Co. Opens Office in Los Angeles

H. K. Porter Co., Inc., of Pittsburgh, Pa., manufacturer of locomotives, pumps, electrical steel castings and heavy forgings, has announced the opening of a West Coast office at 849 Petroleum Building, Los Angeles 15, Calif. Harold A. Hintz has been appointed District Manager for the territory. It is expected that a San Francisco office will be opened up shortly.

## Fuel-Injector Tester For Diesel Engines

For smooth trouble-free operation of diesel engines, it is of vital importance for operators to be able to check the fuel-injection nozzles quickly, conveniently, and accurately, and make adjustments where necessary. Defective nozzles not only impair engine performance but, unless detected, may result in serious injury to the engine, such as carboned-up valves and cracked pistons.

Aircraft & Diesel Equipment Corp., 4401 N. Ravenswood Avenue, Chicago 40, Ill., makes the Adeco nozzle tester which weighs less than  $8\frac{1}{2}$  pounds, including a standard  $3\frac{1}{2}$ -inch-diameter gage and a detachable pump handle  $16\frac{1}{2}$  inches long. It is equipped with a special suction valve to insure quick action free from air troubles. A shut-off needle valve prolongs the useful life and accuracy of the hydraulic-pressure gage. This valve disengages the pressure gage when the tester is used for leakage tests and readings are not required.

This nozzle tester, which may be used on both large and small fuel injectors, is equipped with a 5,000-pounds-per-square-inch-capacity hydraulic-pressure gage with 100-pound gradations spaced along a 270-degree arc. Similar gages of 7,500 and 10,000-psi capacity are also available at no additional cost. The gage is suitable for making tests on a bench or directly on the engine and can be used for any kind of hydraulic testing on fuel-injection pumps, hydraulic control, brakes, accumulators, presses, etc.

Complete information regarding this newest Model PH-24 Adeco nozzle tester may be secured direct from the manufacturer by mentioning this news item.

## Underwater Cutting And Welding Booklet

An article on underwater cutting and welding by H. L. Ingram, Jr., of the Applied Engineering Department of Air Reduction Sales Co., which appeared in *Marine Progress* of May, 1944, has been reprinted in booklet form. In this article the author gives a brief history of the processes, describes the techniques used for both torch and carbon-arc cutting and metallic arc welding underwater, and lists pressure tables for torch cutting at various depths and tip sizes for cutting materials from  $\frac{1}{4}$  inch to 2 inches thick.

Copies of the booklet may be obtained from Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.

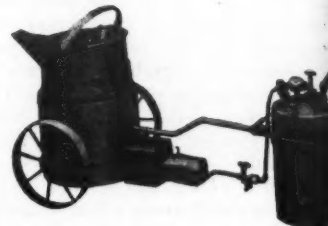
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## PLANNED FORM WORK SPEEDS CONCRETE CONSTRUCTION

*Richmond* offers without obligation, consultation on the proper types of Forms and Form-Ties to be used for a given job; estimates on job requirements and recommendations on specific Form problems.

*Richmond* furnishes layout and detail plans covering ties and their application to the form work.

*Richmond's* method of packing and shipping in accordance with layout plans is a distinct service in itself. *Richmond's* system of labels and color designations as applied to all cartons and bundles is a definite time-saver, and eliminates confusion. In short, the right material gets to the right spot, without delay.

*Richmond's* Tyscru principle is that of a wire coil wound to the contour of a lag thread to receive and develop the full strength of the Richmond Tylag bolt. This bolt, by reason of its simple construction and fast thread, can be re-used indefinitely with no depreciation. For instance... $\frac{1}{2}$ " diameter Richmond Tyscrus have a 5 turn coil (resistance welded) to each end of high tensile wires. These coils are 1" in length, hence they have 5 threads per inch as against 13 machine threads per inch on other tie systems. This is an immediate saving of better than 50% in tightening and stripping time per tie.

*Richmond's* policy of loaning its Form-Tie working parts (tools) free of any rental charge is a big factor in reduced costs because you only pay for lost parts, not for their usage.

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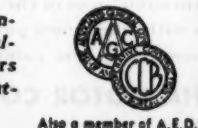


## LIGHT PLANTS?

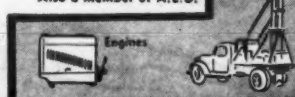
should fit into your construction picture. They are job-designed and field-proven for trouble-free operation. They produce plenty of steady, flickerless power for lighting your job or powering small tools. The complete line of Novo Generator Sets range from 1 KW to 10 KW, AC or DC.

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**NOVO ENGINE COMPANY**



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# Unusual Problems In Cameron County

(Continued from page 74)

tion for expansion other than construction joints placed at noon and night during placing operations. When blow-outs occur, the joint is broken back by hand, the shattered concrete tamped into place for base material, and a wearing surface of the same pre-mix used for bridge floors is laid.

Cracks in the concrete pavement are sealed and some maintenance work done on the asphaltic roads by county forces, using two Standard Steel Works 110-gallon trailer asphalt kettles, but the asphalt roads have been allowed to deteriorate to such an extent that rebuilding will be necessary as soon as men and materials are available, according to Mr. Ruff.

## County Organization

Cameron County, with its 1,000 square miles of area, contains 172 miles of county-maintained paved roads, exclusive of the large mileage on the state highway system. Of these 172 miles, 146 are concrete, 10 are gravel, and 16 have an asphaltic surface treatment of 0.2 to 0.3 gallon of 120 to 150-penetration asphalt per square yard covered with 20 to 30 pounds of 1/4 to 1/2-inch gravel. Cameron County has constructed and maintains 8 miles of levees along the Rio Grande southeast of Brownsville, the maintenance of which requires the services of from ten to fifty men, using rented equipment when repairs become necessary.

The county is divided into four precincts, and a Commissioner elected from

each for a term of two years, with the County Judge, constitute the Commissioners Court which controls all county expenditures.

The normal \$100,000 income for highway purposes, derived from state gasoline taxes and auto registration fees, is allocated within the county on a percentage based on mileage, 12 per cent going to each of Precincts 1 and 2, 24 per cent to Precinct 3, 32 per cent to Precinct 4, and 20 per cent to countywide maintenance without respect to precincts. Each precinct, with a small organization headed by the Commissioner, performs its own maintenance operations on unpaved roads, with the County Engineer serving in an advisory capacity. Heavier operations are conducted by the County Road and Bridge Maintenance Department, consisting of a superintendent and eight or ten men as permanent employees, plus such others as are hired temporarily when needed.

The County Engineer's organization consists of an office engineer, a draftsman, and an instrument man. They prepare specifications for all purchases in excess of \$2,000 made on competitive bids, and in many instances for smaller purchases.

County equipment, when not in use, is stored in a centrally located sheet-iron building, 50 x 150 feet in size, near San Benito. Repairs to equipment are performed in commercial shops located at various towns throughout the county.

## Personnel

The present County Court of Cameron County, Texas, consists of Oscar C. Dancy, County Judge; Ted R. Hunt, Port Isabel, Commissioner from Precinct 1; Mrs. O. K. Mason, Brownsville, Commissioner from Precinct 2; A. D. Bowie, San Benito, Commissioner from Precinct 3; and A. A. Kimmell, Harlingen, Com-

missioner from Precinct 4. A. G. Ruff, who served 18 years as assistant between 1920 and 1938, has been County Engineer since that time, and K. C. Roberts has been County Road and Bridge Maintenance Superintendent for the past six years.

## Safe Electric Motor For Rugged Services

There are many places in field construction, on large pieces of construction equipment, and in shops where an electric motor must be particularly rugged to stand up under continuous service. The F-M protected polyphase squirrel-cage electric motor is designed particularly for rugged service of this type. Its protected frame construction excludes falling particles and dripping liquids in any mounting position. It is equipped with ball bearings sealed in cartridge-type housings and it has high efficiency, a high power factor, and good starting and accelerating torques.

These general-purpose continuous-duty motors, rated at 40 degrees C and designed to carry 115 per cent load continuously without injurious heating, are made by Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill., and are described in detail in Bulletin 1160 which will be sent to readers of CONTRACTORS AND ENGINEERS MONTHLY who write direct to the manufacturer and mention this descriptive text.

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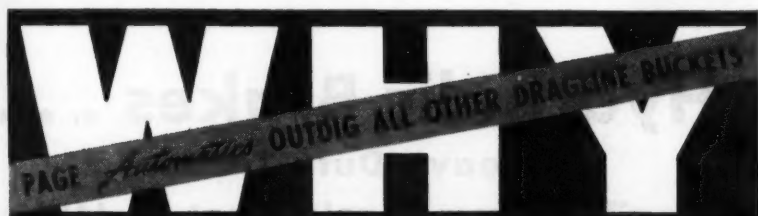
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Automatic DRAGLINE BUCKETS

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## Temporary Quarters For Mass. DPW Shops

(Continued from page 69)

molten state while the compressed air blows it out in a spray. Upon striking the object, the liquid metal cools and solidifies.

Another Department-made portable unit is a table, 6 feet long x 5 feet wide x 3 feet high, mounted on 8-inch Colson rubber casters. Half of this bench is an electrical workshop for testing magnetos, while the other half is a carburetor repair shop. A vertical center panel separates the two activities. The bench has two drop lights and one reel light and, like the other rolling equipment, can be pushed around to where needed.

In the southwest corner is the carpenter shop, equipped with a 3-hp 12-inch DeWalt circular saw capable of twenty-one operations. Here cabs are repaired, wooden machinery parts made, floor boards cut, and boxes constructed. Along the west wall from that corner to the entrance is the plow repair section which takes care of 990 plows, from a small Ford truck plow to a 10-ton tractor V-plow. Iron workers take the plows apart and straighten them out.

Also on this first floor, adjacent to the main shop, are located the paint shop, sand-blasting room, lockers, toilets and showers. The stock room in the basement has 12,310 square feet of floor space. An adjoining garage has 8,880 square feet of storage space, over which is located the main office of the shop.

### Personnel

These temporary quarters, where 98 men are employed, will be maintained until after the war when the Public Works Department will go back to its old shop or will build a main shop more centrally located, with a small garage in each of the state's seven highway districts. This Boston shop of the Massachusetts Department of Public Works, of which Herman A. MacDonald is Commissioner and George W. Schryver and Robert L. Whipple, Associate Commissioners, is operated under the direction of Raymond W. Coburn, Chief Engineer, with James E. Lawrence, Maintenance Engineer, and James Bain, Superintendent of Equipment and Repairs.

### Heavy-Duty Feeder For Large Crushers

The Pioneer-Oro manganese-steel apron feeder, a heavy-duty unit for handling large rock and ore to scalping screens or crushers, is now being manufactured by Pioneer Engineering Works, Inc., 1515 Central Ave., Minneapolis 13, Minn., by arrangement with the Kensington Steel Co. of Chicago. Kensington holds the patents on this feeder, which has several outstanding features.

All wearing parts of the Pioneer-Oro apron feeder, including pans, rollers, chain bushings, and sprocket teeth are of manganese steel. The sprockets on both the head and tail shafts are built with reversible and renewable teeth, made of Oro manganese steel. They can be easily reversed and replaced without

removing the sprocket centers from the shaft or disconnecting the pans.

The Pioneer-Oro apron feeder ranges from 30 to 60 inches wide and from 6 to 25 feet long. The pitch of the pans is 6 and 9 inches on the smaller feeders, and 12 and 15 inches on the larger units.

Contractors interested in further details regarding this heavy-duty manganese-steel apron feeder may secure

them direct from Pioneer by mentioning this item.

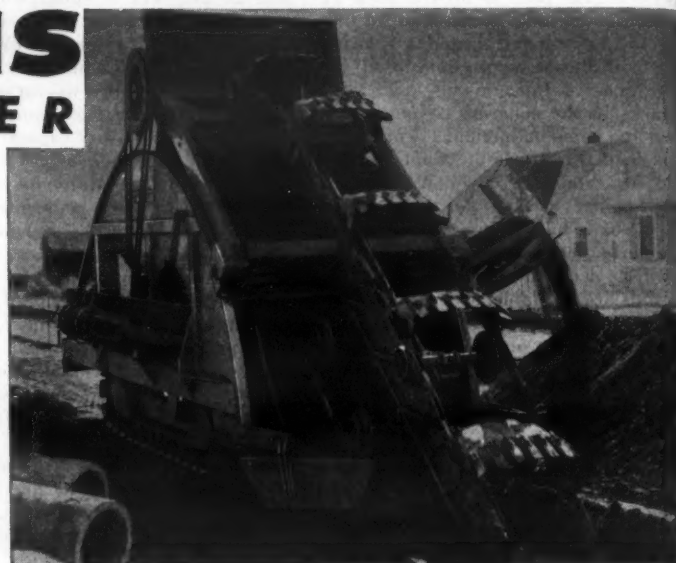
### Flexible-Shaft Drive For Shop Equipment

The use of flexible-shaft machines in equipment repair shops greatly speeds up the repairs that get equipment back into service. Wyco flexible-shaft ma-

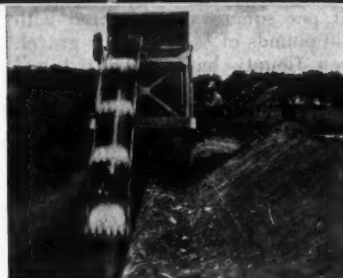
chines, including wheel arbors, drill chucks, grinding wheels and other equipment of this type, are described in detail in Catalog No. 44 issued by Wyzenbeck & Staff, Inc., 838-842 W. Hubbard St., Chicago 22, Ill. Copies of this catalog will be furnished promptly to those writing direct to the manufacturer and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

## PARSONS TRENCHLINER

Digging trenches close to trees, poles, curb, in narrow alleys, or on road shoulders, is efficient and practical with the Parsons Trenchliner. Shifting the boom from side to side to suit the trench location and avoid nearby obstacles, permits off-center digging without loss of production capacity. Trenches may be dug on the line with outside edge of either crawler or as close as 11 inches to side obstruction. Boom is shifted for any location to extreme right or left hand position, by a simple chain and sprocket mechanism. Dual booms may be used at equal depths for extra wide trenches, or for different depths to suit many job conditions.



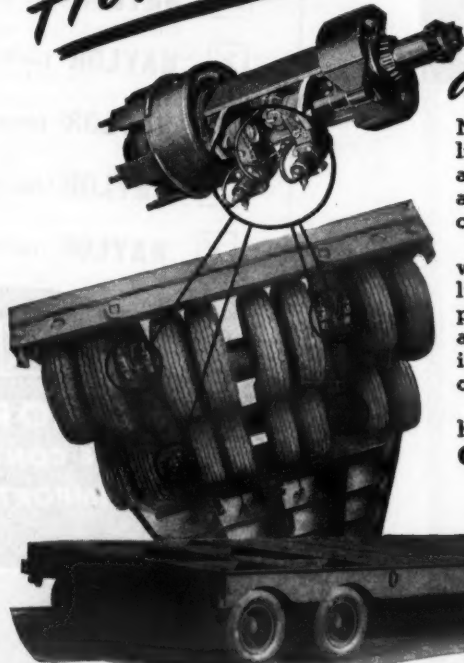
Boom in Offset Digging Position to Pass Side Obstruction.



**THE PARSONS COMPANY** Newton, Iowa  
**TRENCHING EQUIPMENT**



*Here's News!*



## Hydraulic Brakes . . . on Heavy Duty Trailers another new development by JAHN

Now you can get heavy duty trailers with the same kind of hydraulic brake action that has been proved so efficient and safe by truck and pleasure car manufacturers. Jahn engineers have developed and thoroughly tested hydraulic brake application on trailers with capacities of 10 to 60 tons.

This new development means smoother, faster braking action with positive, equal brake pressure on all wheels and permits unlimited axle oscillation without affecting braking action. There's no possibility of partial application or dragging of brakes when operating over rough terrain. Full motive power of the prime mover is utilized in pulling the load. There are no brake rods to require constant adjustment. Safety is increased and maintenance simplified.

When you get a heavy duty trailer, insist on a Jahn trailer with hydraulic brakes.

**C. R. Jahn Company, 1347 W. 37th Place,  
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Any Axle or  
Wheel  
Combination



"COME TO TRAILER HEADQUARTERS"

The Rud-o-Matic Tagline is operated on a spring principle and maintains at all times a positive tension sufficient to steady a clam shell bucket under any and all conditions, and will operate perfectly with the boom at any angle. It eliminates all the grief usually encountered with the average tagline as there are no weights, tracks, pins, carriages, or sheaves to wear out or to get out of order. Because of the large bearings and fewer sheaves, the saving on cable alone would eventually pay for it.

Tagline is complete with fair lead and cable attached and can be installed in less than one-half hour. Most of the crane manufacturers have adopted the Rud-o-Matic as standard equipment.

**McCaffrey-Ruddock Tagline Corp.**

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**RUD-O-MATIC**  
*foolproof*  
**TAGLINES**

The best planner for your personal postwar security is yourself. And probably the wisest plan you can adopt is to invest every extra dollar you can lay your hands on into War Bonds—where they become double-duty dollars. They help finance the war and they'll be useful to yourself and the nation after the war.



# Old N. Y. Pavements Given New Surfaces

(Continued from page 66)

on a Brockway truck supplied the rollers with water.

No interference with traffic resulted from this method of paving in 10-foot strips, and each lane was opened to traffic immediately after paving. Then a top course of 1 inch, loose material, was laid which compacted to 7/8 inch under rolling. The same method of laying was used for the top course. The combined thickness of the resurfaced pavement is 2 1/4 to 2 3/8 inches. Traffic was permitted immediately after the final rolling.

## Mixes Used

The stone aggregate used was lime rock, abundant in this vicinity.

Aggregate and Materials	Passing (Screen)	Retained on (Screen)	Percentages Base Course	Top Course
Broken stone, No. 2	1-inch	1/2-inch	50.0	0.0
Broken stone, No. 1	1/2-inch	3/4-inch	18.0	30.0
Screenings and/or sand, No. 1A	3/4-inch	1/2-inch	12.5	37.0
Screenings and/or sand, No. 1B	1/2-inch	No. 20	13.5	12.0
Screenings and/or sand, No. 20	No. 20	No. 60	2.0	8.0
Screenings and/or sand, No. 60	No. 60	No. 200		5.0
Hydrated lime				0.8
Bituminous material			4.0	7.2
Total			100.0	100.0

Included with the bituminous material was approximately two quarts of workability compound, more of which had to be added on a cold day, while on a hot day it was dispensed with altogether. Asphalt of a 65 to 100 penetration was used for the bituminous material. A total of 3,650 tons of plant-mix was used.

## Resurfacing in Seneca County

Similar resurfacing of village streets has also been completed recently in Seneca County under the direction of Louis Moyer, County Assistant to the District Engineer. In the village of Seneca Falls 1.3 miles of red-brick pavement 30 to 50 feet in width was covered with the same type of mix. Rails of a one-track trolley line were first removed and the trough filled with concrete. Manholes were raised to grade by the village. This old brick pavement was laid in 1908; the sand cushion under the bricks had long since washed out, resulting in waves of bumps and depressions. Many complaints had been received from people unable to sleep because of the noise of traffic passing over this pavement. The new type of paving has remedied that situation and has also been well received because of its dustless quality. A total of 4,000 tons of semi-hot-mix was used on this project.

The village of Waterloo, also in Seneca County, removed a single line of track and 250 feet of turnout from 0.8 mile of red-brick pavement. State maintenance forces filled these 6-inch-deep troughs with truck-mixed concrete, and then placed a 22-foot-wide leveling course where the tracks had been. This 1 1/2-inch course of asphaltic concrete was laid in two strips and served the dual purpose of smoothing over the brick sub-base and giving a crown to the pavement. The layers of coarse and fine mix then followed. This job took 3,000 tons of plant-mix.

On both of these jobs an average of 500 tons was laid a day. For its 25 miles of resurfacing scattered through seven counties, the State Department of Public Works was also supplied with asphaltic concrete from the Auburn plant of the General Crushed Stone Co. and the big Barrett Division plant at Jamesville, N. Y. A total of 50,000 tons was used throughout this District during 1944.

## Planning and Personnel

The sites to be paved are selected following visual surveys made during the winter or early spring months and as

done during the spring and early summer. In addition to this resurfacing program, the District has surface-treated 350 miles of its 1,500 miles of varied-type roads with tar and cover stone. This work was all completed by June.

William Robinson is District Engineer for District No. 3, New York Department of Public Works, with headquarters in Syracuse. Frank Corey is in charge of maintenance, assisted by Mil-

lard Hawk who directs the field operations. Charles Fischer supervises all construction in the District.

## New Foote Dealers

The Foote Co., Nunda, N. Y., maker of highway construction and maintenance equipment, has announced the appointment of the Power Equipment Co., 601 E. 18th Ave., Denver, Colo., as

distributor of its products in that state, and the Bode-Finn Co., 1654 Central Ave., Cincinnati, to act as distributor in Ohio. Both companies will handle the Adnun Black Top Paver and MultiFoote concrete pavers.

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★ ★ Immediate delivery on Gasoline Powered wheelbarrow or round base mounted 3 H.P. Concrete Vibrators, also Gasoline Engine and Pneumatic Chain Saws and most models of Circular MALL-SAWS on suitable priority.

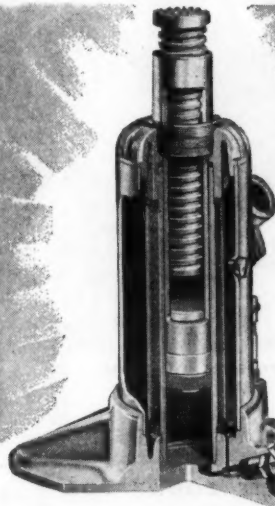
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Tools featured above are the MALL 1 1/2 H.P. Gasoline Powered Concrete Vibrator—also available in 3 H.P. with round base or wheelbarrow mounting—as well as 1 1/2 H.P. Universal Electric and 7500 r.p.m. Pneumatic models; Gasoline Engine Chain Saw which can be furnished in 24", 36" and 48" sizes —also pneumatic models, and MALL Electric Circular Saw, 2 models, 8" blade and 2 1/2" cutting capacity, and 12" blade with 4 1/2" capacity.

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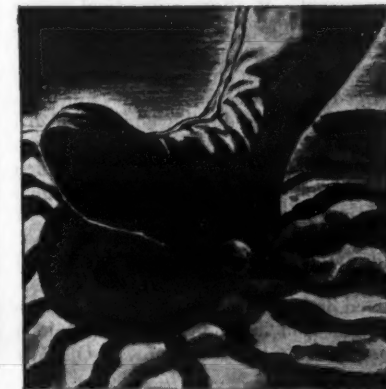
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## Conclusions Reached On Compaction Tests

(Continued from page 77)

Two trips of the pneumatic-tire roller over the bulldozed material did not serve to increase the density on lift 6. However, an average density of 97.3 per cent was obtained on this fill section with the pneumatic-tire roller, and in no case were more than three trips necessary to obtain the required density of 95 per cent. The moisture contents of the fill material in this section ranged from 1.4 to 7.9 above the optimum and averaged 5.5 above the optimum.

### Conclusions

The following conclusions seem justified in view of the fact that there have been neither indications of detrimental results from settlements nor indications of instability on any of the sections of either the Ohio or Indiana projects since the construction of the pavements.

**Both Projects:** 1. The compaction test may be utilized generally to control the construction of embankments regardless of the type of compacting equipment. It offers a practical means of determining when a layer of soil is satisfactorily compacted.

2. Data from compaction tests performed in the laboratory and from density tests made on the compacted fill offer a means of determining the moisture content and lift thickness at which satisfactory compaction may be obtained most economically with a given type of roller.

**Indiana Project:** 3. A density equal to 95 per cent of the maximum as determined in the laboratory in accordance with method T 99-38 of the American Association of State Highway Officials is apparently sufficient to produce highway fills of satisfactory stability when the dimensions of the fills are similar to those on this project. The maximum height of fill in the various test sections ranged from 7 to 10 feet.

4. Soils similar to those comprising the fills on this project may be readily compacted to the desired density by any of the rollers used in this experiment if the moisture content of the soil is within the proper limits. With proper moisture content, equally good compaction was obtained throughout the entire thickness of a compacted layer regard-

less of whether the soil was compacted by the tamping action of the sheepfoot roller, the kneading action of the pneumatic-tire roller, or the compression produced by the three-wheel roller.

5. The moisture content of fills may be controlled within 1 of the optimum value when the soil is obtained from a borrow pit, as was done on this project. Such rigid control, however, does not seem justified in light of the densities and stabilities obtained in this experiment with moisture contents ranging from 3.5 below to 7.9 above the optimum.

6. The high degree of stability attained at the wide range in moisture contents indicates that control of compaction on the basis of density alone will produce satisfactory results, provided the soil contains sufficient moisture for the roller to be effective and is not so wet as to interfere with the operation of the rollers. Definite limits above and below the optimum will depend entirely on the character of the soil. These limits may be determined by observing the performance of the rollers in conjunction with density tests.

7. The amount of fill material compacted per hour by a roller of a particular type depends on the type of soil, the moisture content of the soil, the thickness of the layer, and the speed of the roller. With soils and moisture contents typical of this project, it was found that when the loose thickness of the soil layer was increased from 6 to 12 inches and when the rollers were operated at their maximum speeds, a corresponding increase in roller capacity was obtained without any sacrifice in compaction.

**Ohio Project:** 8. Highway fills of satisfactory stability may be obtained when constructed in layers compacted to maximum density as determined on the same types of soils in accordance with the standard compaction test, Method T 99-38 of the American Association of State Highway Officials. Such embankments may be paved immediately following construction without danger of detrimental settlement.

9. Soils similar to those comprising the fills studied may be readily compacted to the desired density by any of the rollers used in this experiment when spread in layers having a loose thickness of 6 to 9 inches. The soils ranged from silty clay loams to clays having physical properties of the A-4 to A-7 groups. They were of friable to hard consistency when dry but were plastic

when wet.

10. A density equal to 95 per cent of the maximum obtained in the compaction test is apparently satisfactory when the type of soils and the depth of the fills (5 to 11 feet over the old fill core and 7 to 21 feet on the widened portions) are similar to those on this project and when the moisture contents are reasonably close to the optimum.

11. Control of the per cent of moisture within 1 of the optimum value is not practicable where the soil delivered

to the fill is a mixture of materials varying in moisture-density characteristics. It is desirable that a greater permissible variation in moisture content from the optimum be established and this permissible variation should depend on the type of soil.

12. The use of moisture-density curves typical of the soils to be used and the selection of the curve applicable to the soil used facilitate the use of compaction test data under variable conditions, and

(Concluded on next page)



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## Soil Compaction Tests In Indiana and Ohio

(Continued from preceding page)

is a practicable method of field control. 13. The construction of embankments may be controlled in accordance with the moisture contents and densities indicated by compaction test data without causing delay in construction operations.

14. The compaction of areas rolled at maximum roller speed is equal to that obtained at slower speeds. The higher speeds result in a corresponding increase in roller capacity.

### Personnel

Two independent reports were prepared on these projects, entitled "Fill Construction Experiment in Indiana" and "Fill Construction Experiment in Ohio". The report from which this article is prepared was an integration of these two independent reports. W. T. Spencer, Soils Engineer of the State Highway Commission of Indiana, participated in the preparation of the Indiana report. H. E. Marshall, Geologist of the Ohio Department of Highways, participated in the preparation of the Ohio report. Lt. Col. R. R. Litehiser, former Chief Engineer of Tests, and K. B. Woods and Captain C. H. Shepard, former Assistant Engineers of the Ohio Department of Highways, cooperated in planning and directing the Ohio project. For the Public Roads Administration, Lt. Henry Aaron, former Highway Engineer, participated in the preparation of both reports.

### A Mechanical Joint For Cast-Iron Pipe

A mechanical joint for cast-iron pipe, which makes it possible to join bell-and-spigot pipe in from two to five minutes, is being made by Dresser Mfg. Co., 41 Fisher Ave., Bradford, Pa. This Bellmaster Style 85 mechanical joint makes the joint by the compression of a resilient gasket between the inner and outer rings and against the pipe by capscrews, effecting a permanently tight and flexible seal. It is designed for use with Bellmaster pipe which is made by leading cast-iron pipe companies.

To install this joint, the spigot end of the pipe and the inside surface of the bell are wiped out in the usual way. The Bellmaster is then inserted in the bell end of the pipe, with the capscrews facing out. Next the mechanical joint is turned to the right until the "lug" hits the stop in the bell. Following this, the spigot end of the pipe is pushed into the Bellmaster joint the full depth of the

bell. To complete the joint, the screws are tightened up uniformly with a special wrench.

Complete information with illustrations, sizes and specifications will be found in Form 441A which will be sent promptly to those writing direct to the manufacturer and mentioning this item.

### Wood Mfg. Names Dealer

The Wood Mfg. Co., manufacturer of the Wood Roadmixer traveling mixing plant, has announced the appointment of Fehrs Tractor & Equipment Co., 1809-11 Cumming St., Omaha, Nebr., to distribute its products in that state.

### LINN CATRUK AND SEMI-TRAILER



THIS LINN CATRUK, as a prime mover, is equipped with rotatable crane, seating capacity for a crew of 14, large tool compartments and, in combination with a quickly detachable LINN SEMI-TRAILER, has a definite use as a cargo, salvage, construction or emergency vehicle.

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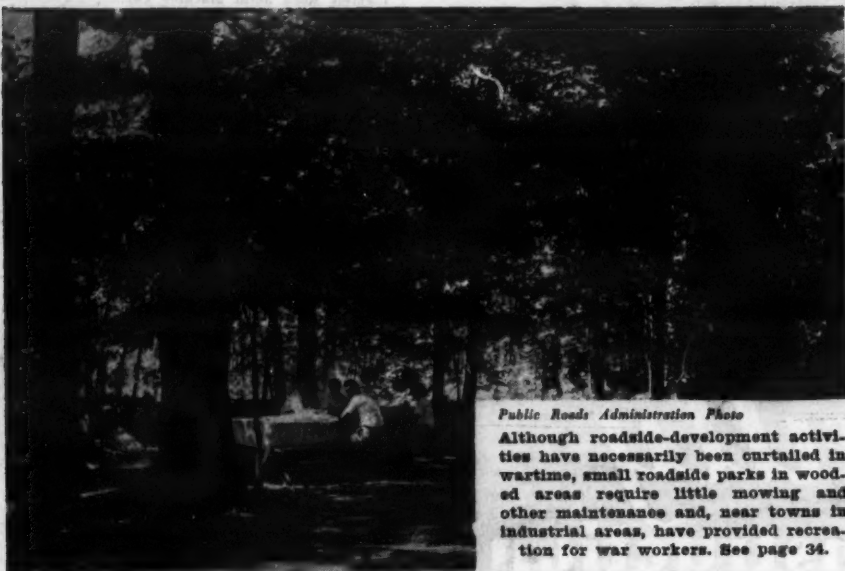
# Contractors *and* Engineers Monthly



Three typical snow clearing operations by the Michigan State Highway Department. First the bank is pulled in by a wing plow on a power grader, then the snow is thrown off the right-of-way by a rotary plow and finally the road is cleaned up by a one-way speed plow. See page 7.



U. S. Engineers Photo  
Two Bucyrus-Monaghan draglines with 150-foot booms placing the dirt in Barker Dam, a 14-mile earth dam across Buffalo Bayou to protect Houston, Texas, from floods. Maceo Construction Co. of Clearwater, Calif., did this 3,474,000-cubic yard job. See page 15.



Public Roads Administration Photo  
Although roadside-development activities have necessarily been curtailed in wartime, small roadside parks in wooded areas require little mowing and other maintenance and, near towns in industrial areas, have provided recreation for war workers. See page 34.

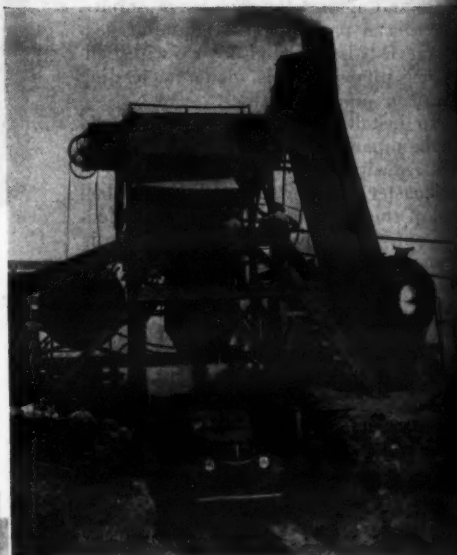


Above, forcing water from beneath a concrete pavement by air pressure, preliminary to mud-pumping operations in District V in California. See page 29.



The bearing capacity of the entire subgrade on which new paving was to be laid at the Yucca, Ariz., Army Airfield was tested by a Le-Tourneau scraper loaded to 35,000 pounds on each of the two rear wheels, and pulled by an Austin-Western 99 power grader, shown below. At left, aggregates for the hot-mix paving were excavated from a dry wash by a Bucyrus-Erie 37-B shovel, and mixed in a Standard Steel Works asphalt plant, at right. See page 23.

U. S. Engineers Photos





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